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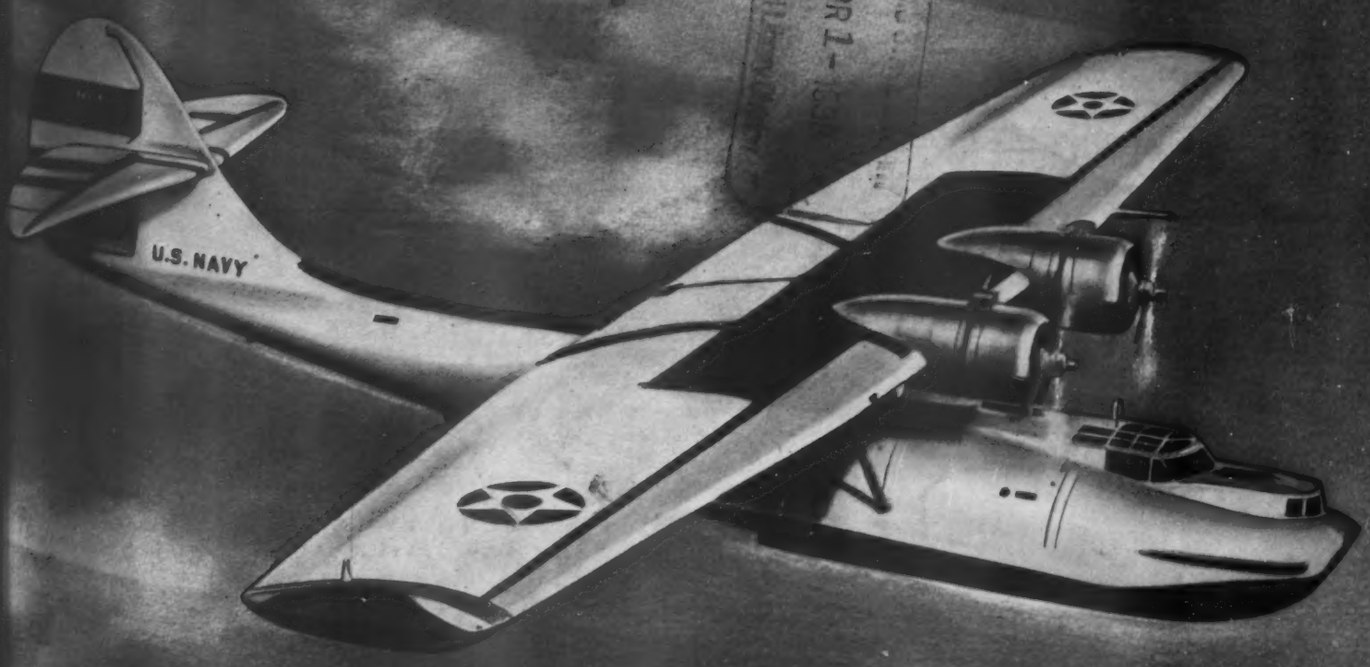
AVIATION

The Oldest American Aeronautical Magazine



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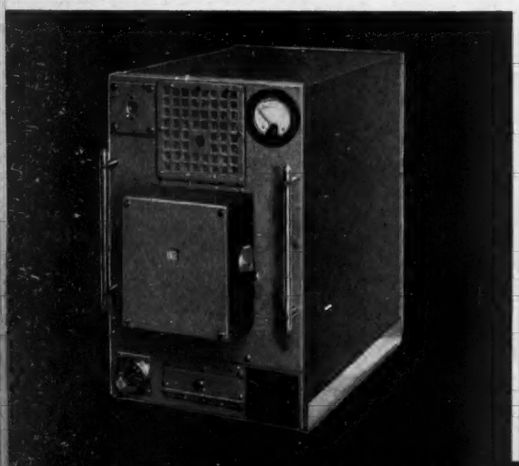

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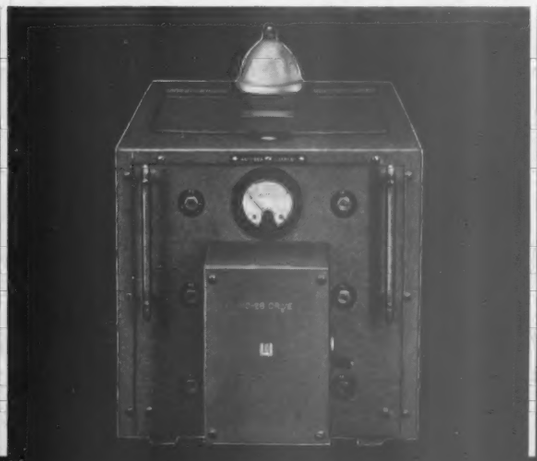

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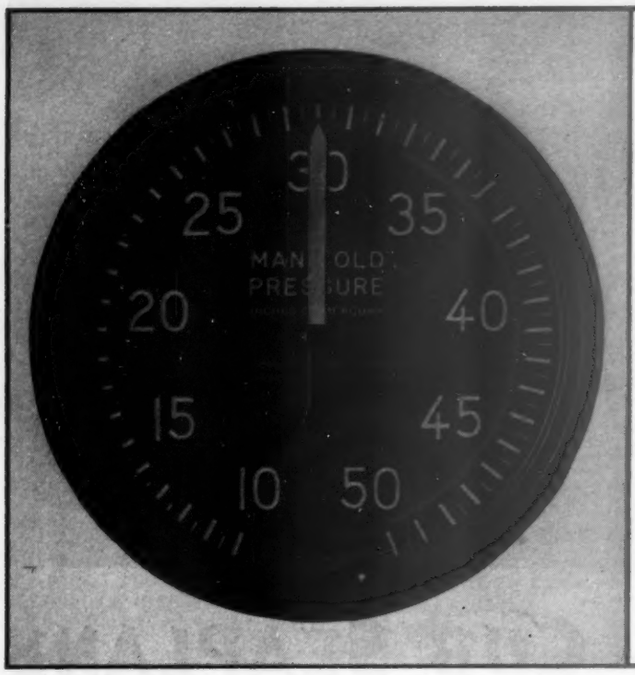

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The Kollsman Manifold Pressure Gage shows the absolute pressure in the intake manifold of an airplane engine. Its mechanism is sealed within a vacuum cartridge* where it is protected against all dust and dirt and against the corrosive action of fuel vapors. This permits the use of hardened steel pivots and jeweled bearings—the best possible form of mechanical construction. Connection from the manifold terminates at the outside of the flexible wall of the vacuum cartridge.

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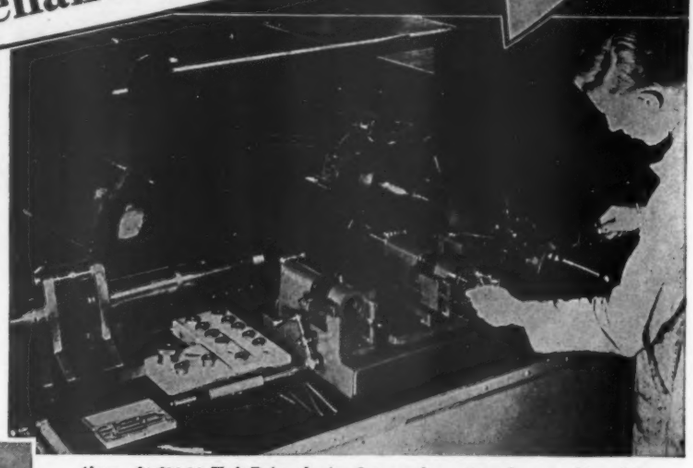

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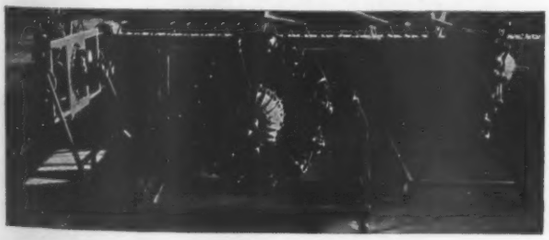

Above—Twin row Wasp 650 h. p. motor, a part of Parks training equipment—a type used on today's modern airliners.

Above—Engineering drafting in this course occupies 5 hours per week for 12 weeks.

Above—Parks Air College orchestra spotlights school social functions.

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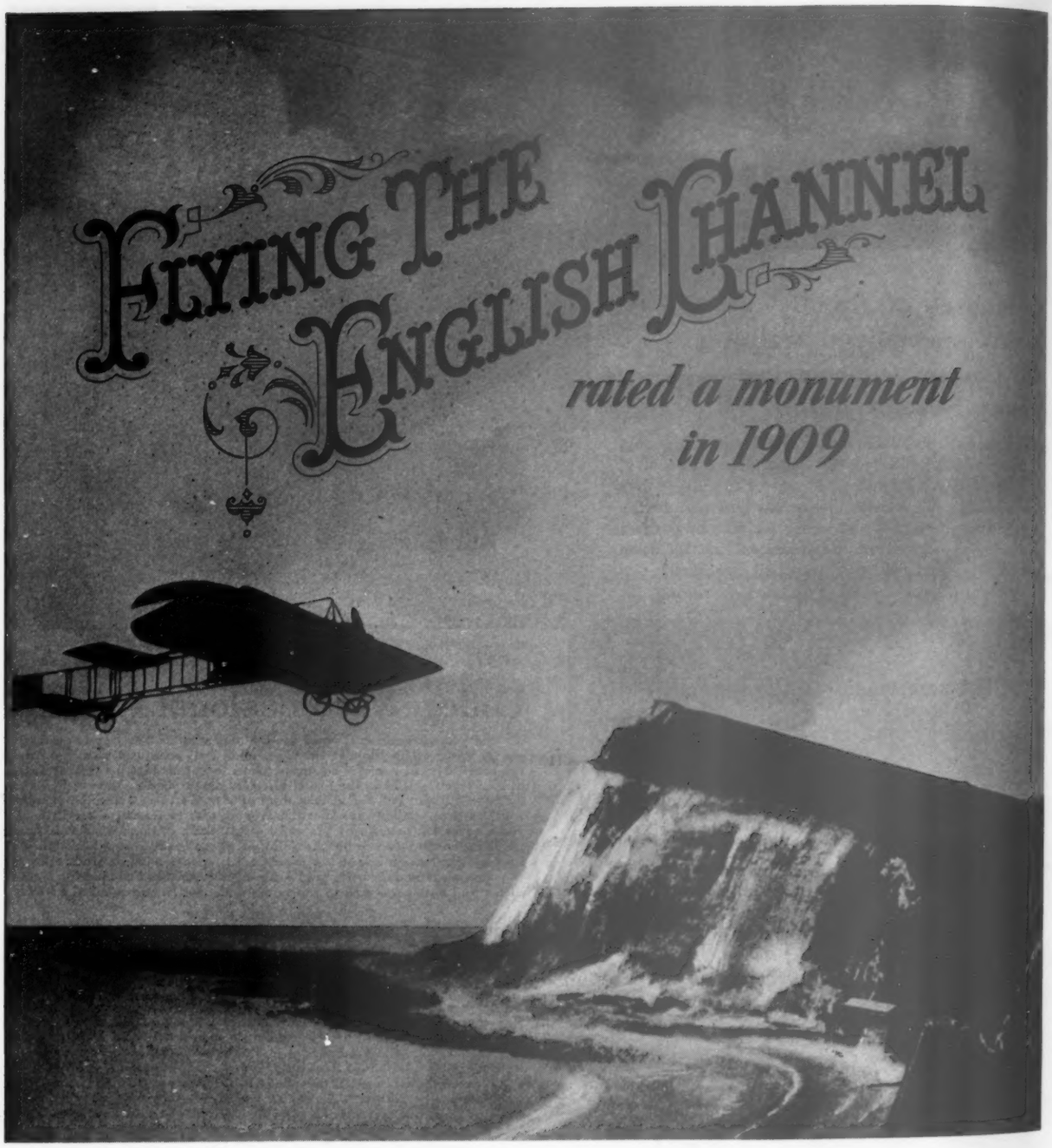

ALL England was stirred, 29 years ago, when M. Bleriot flew the 25 miles from Calais to Dover Downs. Later a monument was erected on the spot where he landed. Now *daily* channel flights are news only in airline time-tables.

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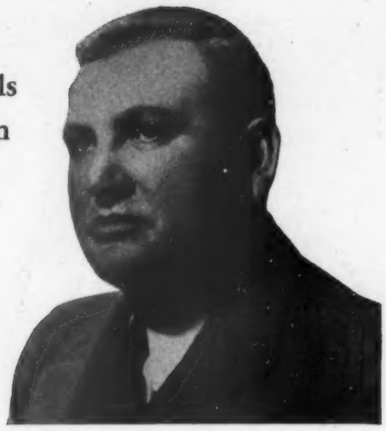

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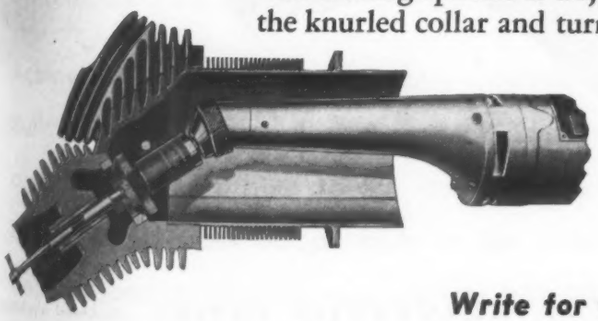

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(February 1937 — January 1938)

Months	Number Graduated	Number Placements	No. Co.'s Employing Graduates
1937			
Feb.	4	13	7
Mar.	33	21	11
Apr.	8	16	6
May	1	16	6
June	34	14	8
July	5	7	2
Aug.	4	2	2
Sept.	20	17	7
Oct.	4	3	2
Nov.	2	2	2
Dec.	29	7	3
1938			
Jan.	7	14	6
TOTAL	151	132	27

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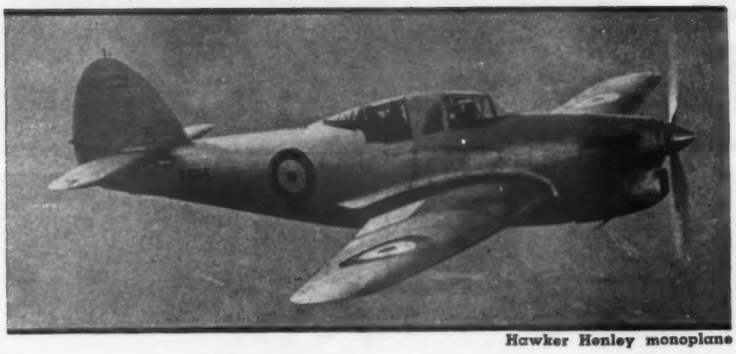

Hawker Henley monoplane

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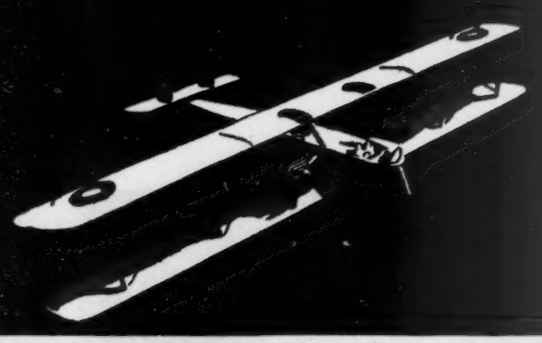

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From the Skyways of the World

» VERILY the state of celibacy has its points! From out West we learn that two of the industry's most happily married men, after safely surviving more than twenty years of flight hazards, have suffered grave injuries at the hands of their own iniquitous offspring. Claude Ryan took his family for an outing in the snow and while tobogganing with the kids he is said to have proved a poorer toboggan pilot than plane pilot, winding up with a fractured vertebrae. The vertebrae is now ensconced in a plaster cast and Claude keeps the cast company. At last reports Claude was hobbling back to work a couple of hours a day instead of his usual sixteen. Maybe he'll take a "refresher" course in tobogganing before he tries to solo a snow scooter again.

» AND UP AT THE CALIFORNIA HOSPITAL in Los Angeles, Al Menasco was flat on his back early in March with a broken fibula (shin bone to you). Al has safely survived a number of flying mishaps but his son Bill proved too much for Al. It seems that "Daddy" was demonstrating the approved tackling stance for his football minded son. We hope Al will be back on his feet in time to see son Bill play ball this fall. Looks like Bill might be the terror of the gridiron after that lesson. With broken arms and legs strewn in his wake Bill may merit the title of the Menasco Mangler, or the Menasco Mauler.

» OH YES! Across the hall from Al Menasco we found Hall Hibbard, surrounded by a bevy of beautiful nurses admiring his appendectomy—at least admiring the simply scrumptious scar which the doctors left where his appendix had been. But our guess is that Hall's lift drag ratio will be considerably improved by the operation.

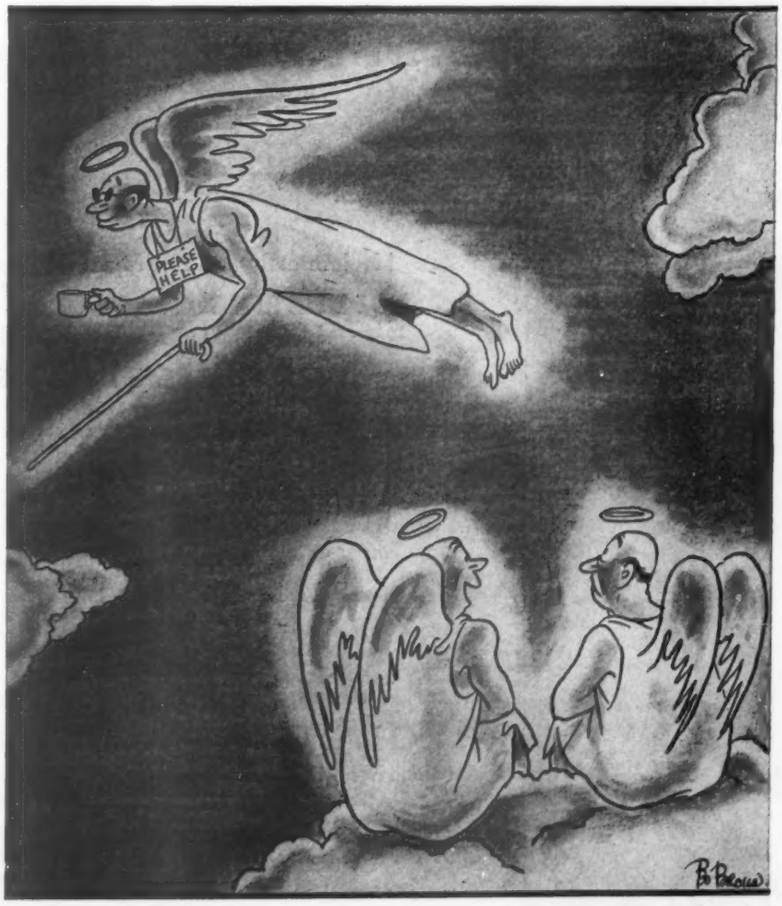
» SORRY—but at last reports most of the remainder of Southern California's aviation people were to be seen staggering around in a disgustingly healthy condition.

» AN APOLOGY is due to Paul Dorsey. The handsome photograph of the nose of a Western Air Express Douglas that appeared as a frontispiece in the March issue of AVIATION was made by him at Burbank Airport.

» THE FIRST ISSUE of a news letter sent out by the Seaplane Flying Association has just come to hand and it looks very interesting. It comes over the signature of Dan Brimm, S.F.A. secretary, well-known to readers of AVIATION.

According to Dan's letter, the Association now has a membership of over 70, most of whom are in the east but with a definite growth westward in evidence. The letter goes on to cover a variety of subjects from the location of seaplane bases up and down the east coast to complaints from members on difficulties of fueling at certain points.

The Association has some good men behind it, as can be seen from the personnel of the Board of Governors, which includes Rudolph Loening, president; George Post, vice-president; Dan Brimm, secretary; Donald Cooke, treasurer; Felix DuPont, Jr., Robert Love, and Juan Trippe.



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Mechanically and Hydraulically Operated

OPERATING CYLINDERS FOR HYDRAULIC BRAKES

TAIL WHEEL KNUCKLES
For "Streamline" Wheels, Steerable and Swivelable with Shimmy Dampener

PNEUDRAULIC SHOCK STRUTS
Designed and Tested to Meet Individual Requirements

PILOT SEATS
Standard Army and Navy Type

Engineering Information is Available to Those Interested

BENDIX
PRODUCTS CORPORATION

Airplane Wheel and Brake Division — South Bend, Indiana
(Subsidiary of Bendix Aviation Corporation)

Western Representative: PACIFIC AIRMOTIVE CORPORATION, Burbank and San Francisco, California

Side Slips

By
ROBERT
OSBORN

» IN THIS COUNTRY we have been afraid for some time back that serious hostilities were about to break out between the "High Level Route" and the "Low Level Route" trans-continental air lines over a series of advertisements. Now, just when that difficulty between them was getting straightened out, an underwear manufacturer starts advertising that the pilots of one route wear his underwear, which is so comfortable that

"no squirming" is necessary for the pilots on the long flights. We suppose that the second line will have to have their pilots flying in extra comfortable pajamas, and then the first line will have to advertise their pilots in extra special comfortable bathing suits, —and so on. There's no telling what this crisis might lead to.

» ALL OF WHICH makes it seem that this flying business is getting more complex every day. From these advertisements in the newspapers and magazines we learn that pilots must not only smoke a certain brand of cigarettes, alkalize and settle their stomachs with a patent medicine, time their flights with only one type of watch, but now must even wear "no-squirm" underwear.

We are afraid that the Bureau of Air Commerce will be putting all of this into CAR one of these days.

» WHENEVER ANY NEWS ITEMS or editorial are quoted from *Il Popolo D'Italia,* the foreign editors usually add, "This newspaper is generally accepted as reflecting the views of Mussolini and the Italian government." This being the case we suggest that *Il Popolo* is in need of the services of an aviation editor, if the other countries are to retain their present high opinion of Italian aeronautical progress.

A clipping from that paper mailed to us by Dr. Ing. G. P. Casiraghi shows a photograph of the Mayo Composite airplane which is now undergoing flight testing in England. As most AVIATION readers know, the Mayo project consists of a smaller heavily-loaded seaplane mounted on the top wing of a large flying boat; they take off as a unit and after sufficient altitude has been gained the smaller ship is detached and goes on its way. However, the Italian editor uses the following novel caption under the picture: "A new kind of aerial taxi has entered in service in America. It is composed of an aircraft for passengers to which is attached another aircraft for baggage."

» THE INTREPID AVIATOR dropped into our office the other day for a mid-air refueling on our cigars. In passing he commented that he was always in favor of progress in aeronautics but he deplored any departure from the basic principals which had been with us since time immoral,— for instance he read where a pilot's wife had obtained a divorce from him,

in Camden, N. J., on the grounds that he had a girl at every airport.

» "REP. RALPH E. CHURCH (R. Ill.) announced that he would request the House Naval Affairs Committee on Friday to subpoena leading airplane manufacturers and technical authorities for information regarding the relative strength of bombing planes and battleships before the committee acts on the billion-dollar naval expansion bill."—United Press Dispatch.

In order that the regular officials of aircraft manufacturing companies may be able to get a little work done at their own plants, it would seem advisable for each company to appoint a special Vice-President for Testifying Before the Congress.

» YOU MAY REMEMBER that we have been making complaints from time to time that this country was being very careless in the matter of maintaining the romantic side of aviation, —orders to aviators in regard to their false teeth,—news of the building of fertilizer-spreading planes,— and so on. We warned that if this sort of thing continued, all small boys would decide to grow up to be G men or movie actors, instead of fliers, which would be a serious state of affairs for our national defense.

Now we are glad to report a definite attempt to conserve this valuable national asset,—at least so far as the Army Air Corps is concerned. We've just seen the new blue dress uniforms, complete with capes, gold braid, mess jackets, and everything, which will become standard next fall.

★ ★ ★ **AVIATION** *for April, 1938* ★ ★ ★

AN OPEN LETTER

To: THE PRESIDENT and
THE CONGRESS of the United States.

GENTLEMEN:

TODAY AVIATION IN AMERICA stands at the cross-roads. What happens in the course of the next few weeks will determine whether, at long last, we are to set up proper machinery for the formulation of a clear-cut, far-sighted governmental policy to coordinate aviation's many-sided and complicated activities, or whether we will be allowed to blunder along from crisis to crisis as has been the case in the past. That the industry has survived the tossing about it has received in the past ten years may be recorded as one of the wonders of the age. That it made tremendous progress during the period is nothing short of miraculous.

But we can no longer afford to assume that progress will continue indefinitely under a policy of haphazard opportunism. A glance about the world of today should establish that point for you beyond all shadow of doubt. Aviation has passed beyond the experimental stage. It is no longer a mere toy for the scientist, or simply a source of vicarious thrills for the man on the street. Aviation has come of age. It has become an integral part of our national life, weaving strong threads into the web of our national commerce and tough fibers into the warp of our national defence. Quite literally, this country's aviation has become everybody's business.

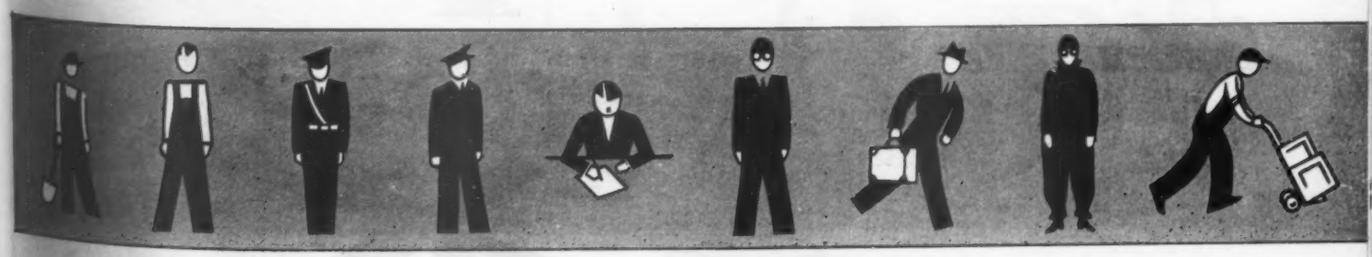
On the pages that follow we present the evidence of the truth of that contention. You will realize as you read that every one of us has a stake in this vital industry. Today its fields and factories employ tens of thousands of workers, and represent hundreds of millions of dollars of investment. Tomorrow these figures will be multiplied many fold.

The problems of this industry are many and varied. For your convenience we have summarized those that we consider to be most critical, together with a recommendation for immediate action which we hope will be given your earnest consideration.

At this moment the future of aviation in this country is in your hands. Yours is the choice whether this great national asset is to continue to drift aimlessly about as a free balloon at the mercy of every political breeze, or whether, like a swift airliner, it is to be piloted safely and surely toward its manifest destination.

Respectfully yours,

The Editors of AVIATION



THIS COUNTRY'S AVIATION

LAST YEAR THESE AMERICANS –

30,000 FLYING STUDENTS

OWNERS OF 6,000 PRIVATE PLANES

1,325,000 TAXI OR HOP CUSTOMERS

WRITERS OF 300,000,000 LETTERS

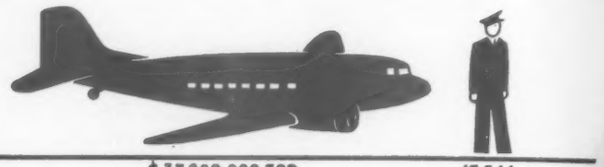
PURCHASERS OF 1,268,000 TICKETS

SHIPPERS OF 628,000 PARCELS

PAID OUT $304,600,000 FOR –

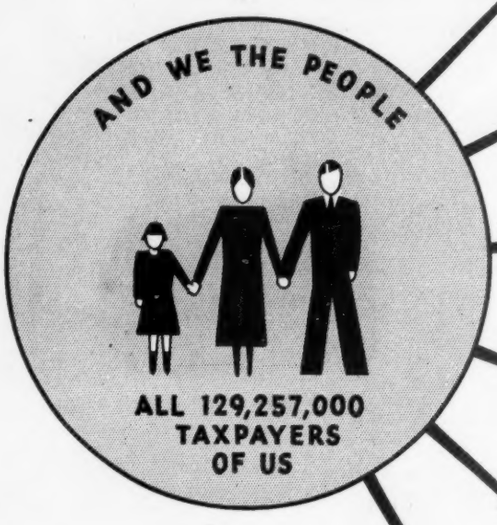
$13,300,000 FOR NON-SCHEDULED FLYING

7,000 EMPLOYEES



$37,200,000 FOR AIR TRANSPORT

17,546 EMPLOYEES



$106,000,000 FOR THE ARMY AIR CORPS

20,707 OFFICERS AND MEN

$97,000,000 FOR NAVAL AIR FORCES

20,671 OFFICERS AND MEN

$1,400,000 FOR COAST GUARD AVIATION

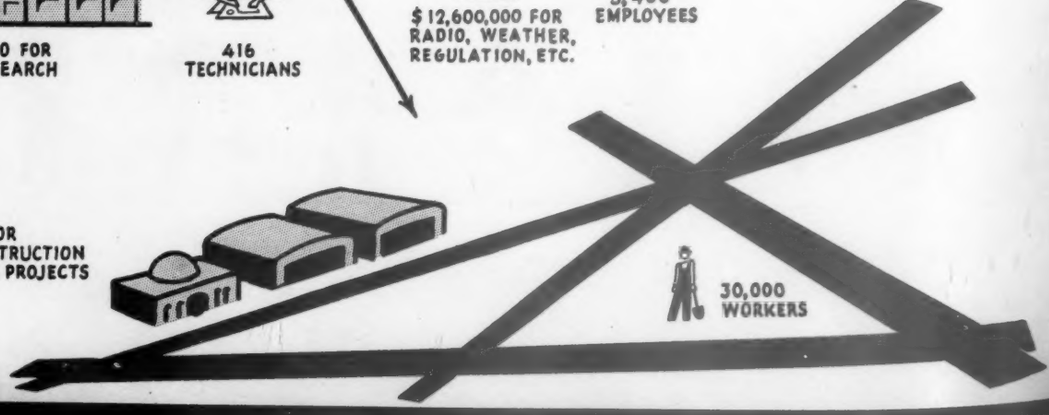
391 OFFICERS AND MEN

$2,100,000 FOR BASIC RESEARCH

416 TECHNICIANS

$12,600,000 FOR RADIO, WEATHER, REGULATION, ETC.

3,400 EMPLOYEES



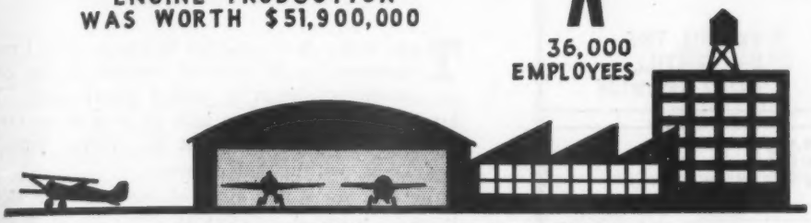
IS EVERYBODY'S BUSINESS

WHICH IN TURN SUPPORTED THESE ESSENTIAL INDUSTRIES

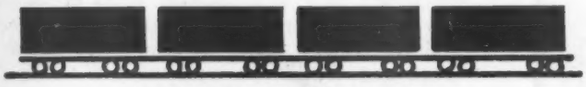
ENGINE PRODUCTION
WAS WORTH $51,900,000

ACCESSORIES
AMOUNTED TO
$19,500,000

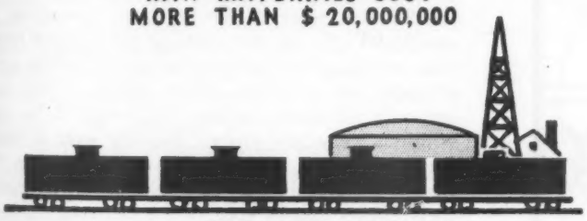
36,000
EMPLOYEES



TOTAL OUTPUT OF AERONAUTICAL
FACTORIES REACHED $114,990,000



RAW MATERIALS COST
MORE THAN $ 20,000,000

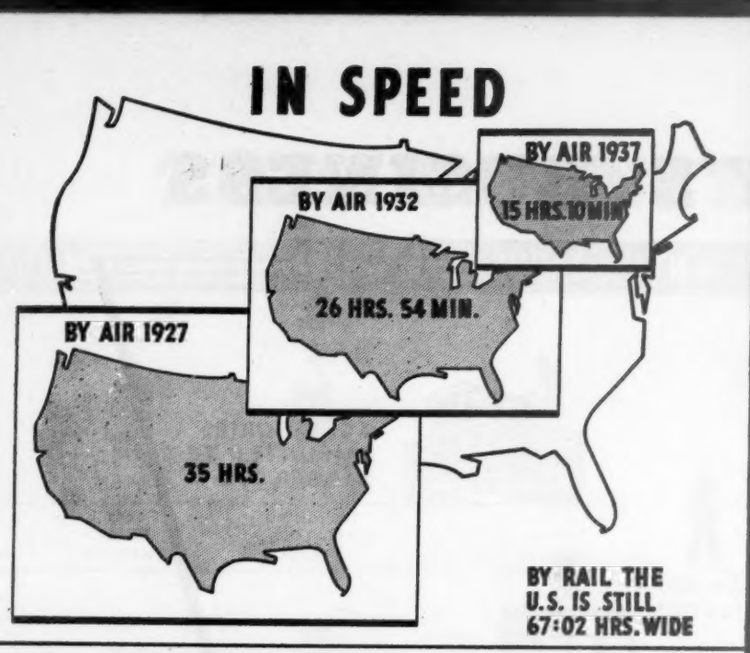


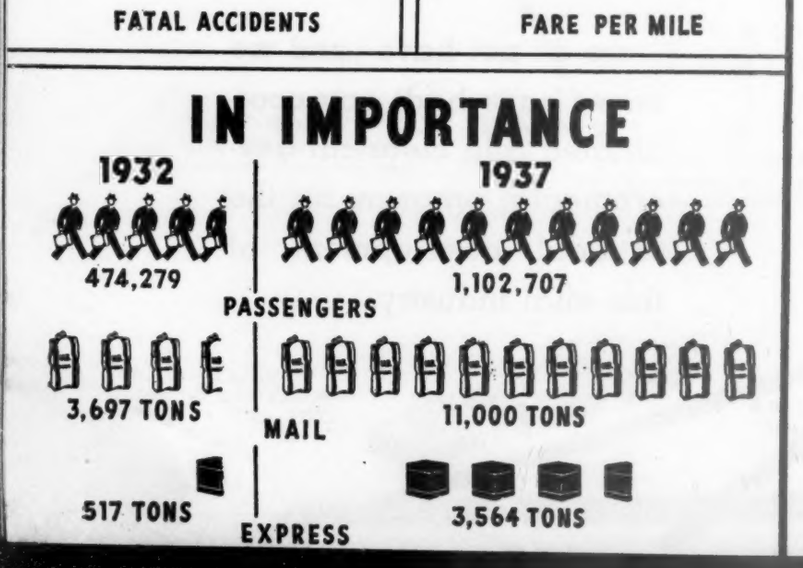
FUEL AND OIL
CAME TO $11,400,000

THE REST OF THE WORLD

YET—

—we do not have (and we never have had) any coordinated and clear-cut governmental program for the rational development of this vital industry.





OUR AIRLINES

But uncertain governmental

THE FIRST MAIL PLANE to reach San Francisco destroyed a 50-year-old concept of our country as something almost a week's travel wide. Today luxurious airliners have laid an over-night yardstick upon our map and brought us, North, South, East and West, within that compass.

Yet speed is not air transport's entire stock in trade. Already it matches all other forms in comfort for passengers and protection for cargo. Far more importantly, the airplane's unit-size gives airline schedules an elasticity and a frequency of schedule which has opened new concepts in transport convenience. In 1937 a traveller could fit his plans to any of 23 daily round trips between New York and Chicago; choose among 20 round trips between New York and Washington; plan a trip to the Pacific Coast on any of 15 round trip schedules.

What of safety? Technicians, executives, governmental officials, are battling on a dozen fronts to close the gap between the occasional airline accident of today and absolute airline safety. Their goal is not only ultimately certain, it is sure to be reached within a very few years. Slightly over a year ago every group concerned in this struggle met in Washington to coordinate their plans. The results of their efforts can be seen in the adjacent chart—a 60 per cent reduction in fatal airline accidents within a single year. Add to that a nationwide improvement of navigation aids already begun by the Bureau of Air Commerce. Add new discoveries in recent months which promise elimination of static interference with airline radio. Add the immediate prospect of new "absolute" altimeters and automatic blind landing devices. Add the steady progress in equipment design, operation and maintenance. No wonder the air traveller can already buy insurance at mileage rates identical with those offered for railroad passengers.

Progress has been swift, too, toward reasonable fares. Before the ICC cut passenger fares and Pullman surcharges in 1937, air travel could be purchased at rates approximating train-plus-Pullman charges. Fare cuts tried out this winter on many air lines promise air tariffs will soon once more approximate that level. The Post Office cut postage rates a few years back—and has more than got its

MOVE AHEAD

policies threaten their future

losses back in doubled volumes. Express charges have tumbled.

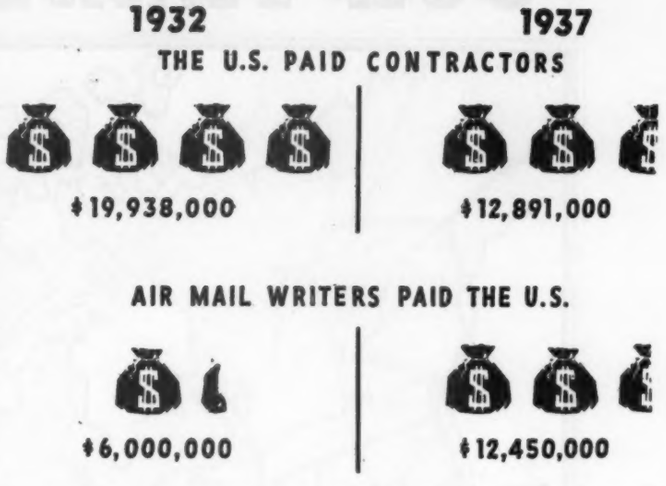
The overall result has been a public move toward airline patronage that year by year has mounted in steady progression. Ten years after the first passenger stepped on a U. S. transport plane, the airlines sold more than a million tickets annually. Twenty years after the first air mail experiments, American business could no more put up with the loss or serious curtailment of the air mail service than it could stand suspension of the country's telegraphic system.

And all this has been accomplished at less direct cost to the government than the purchase of two battleships. Last year the net cost to the Post Office for its entire domestic air mail service was less than its expenditures on its pneumatic tube equipment. Money spent for air aids, even including funds for the new construction program, is no larger than the cost of the government's light house service.

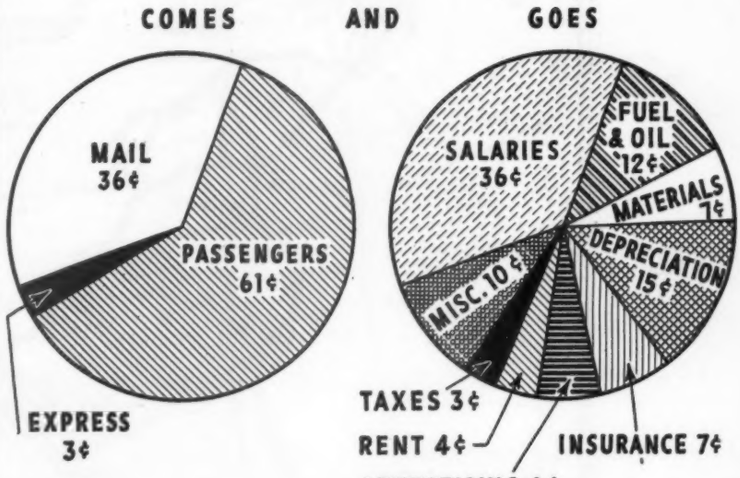
Air transport withal is that ideal of all transport economists. Its financial structure is simplicity itself. It has no interlocking managements or directorates. It meddles in no way with state or local politics. It is fiercely competitive within itself and with other transport forms. Its rate of technical progress is as swift today as it ever has been.

Yet some of these things are being maintained on too stringent a basis by governmental regulation and by the uncertainties of governmental policies. Many air lines need new finances yet cannot negotiate for them save as purely speculative enterprises. The fierceness of inter line competition has led toward a race for new equipment which threatens to overextend a number of carriers. It has produced an incipient rate war. It interferes with broad gauge sales efforts and the psychology needed for absolute safety. No one wants freedom from the reproach of "subsidy" more than the airlines themselves. No one wants three cent passenger fares more quickly. But the difference between reaching such goals in the well-balanced course of a five-years progress and having them confusedly thrust upon them in a few more months will mean to the airlines a difference between a sound future and a permanent crippling.

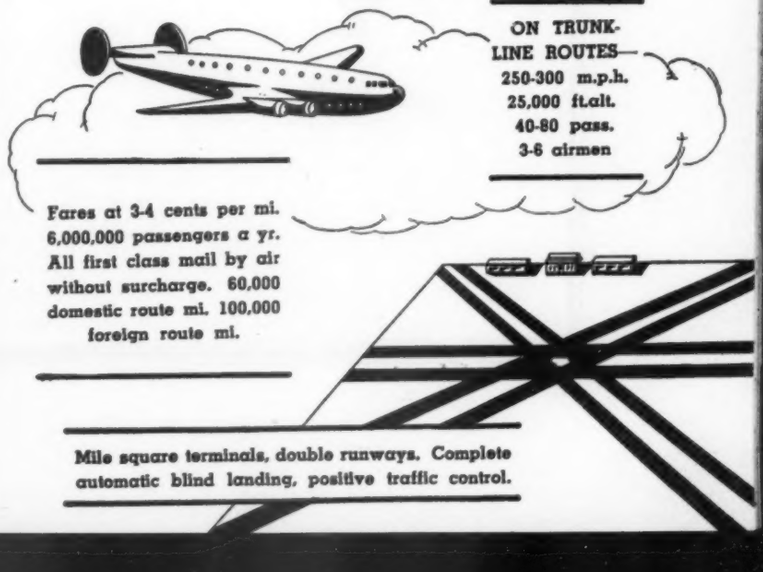
AIRMAIL "SUBSIDY" IS VANISHING



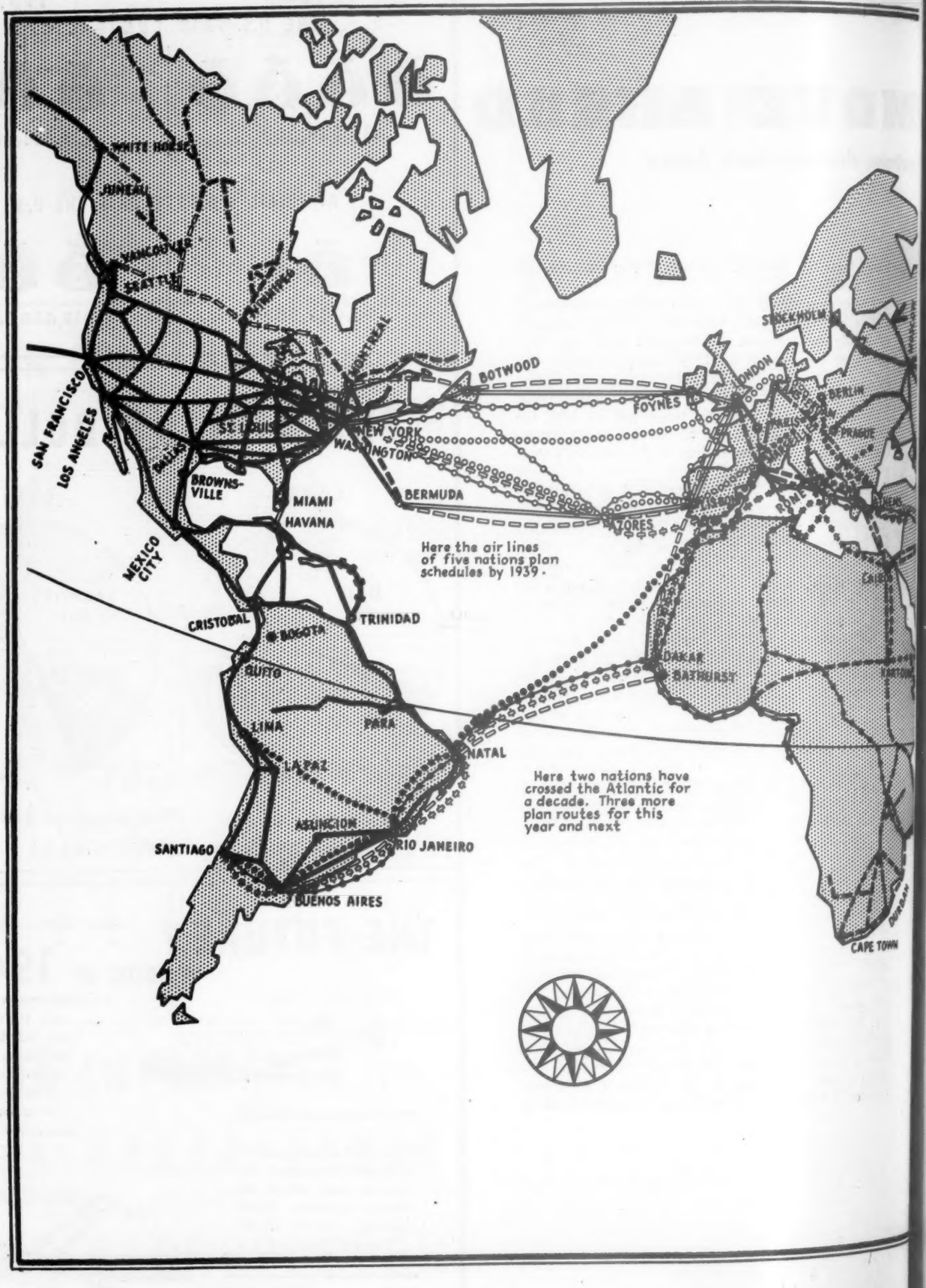
THE AIRLINE DOLLAR



THE FUTURE? A LOOK AT 1943


ON TRUNK-LINE ROUTES—
250-300 m.p.h.
25,000 ft.alt.
40-80 pass.
3-6 airmen
Fares at 3-4 cents per mi.
6,000,000 passengers a yr.
All first class mail by air without surcharge. 60,000 domestic route mi. 100,000 foreign route mi.
Mile square terminals, double runways. Complete automatic blind landing, positive traffic control.

OUR TRANSPORT STAKE

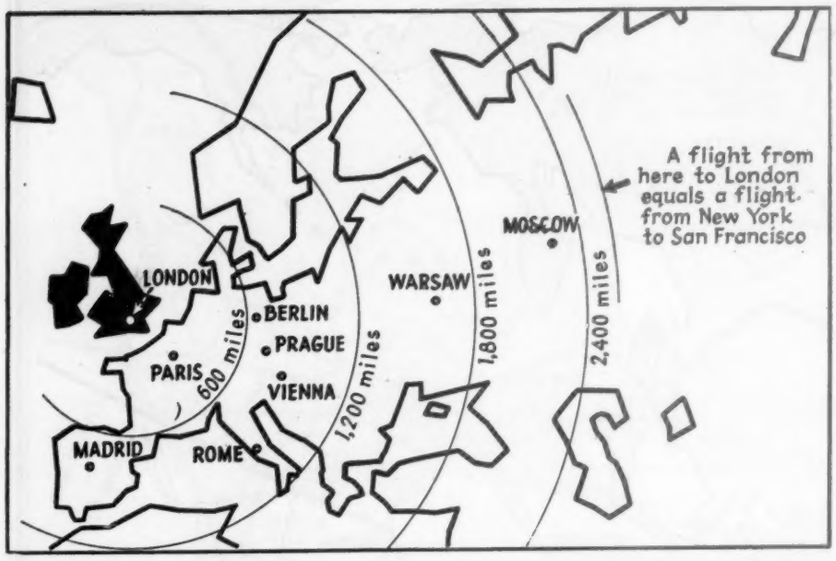


IS WORLD WIDE

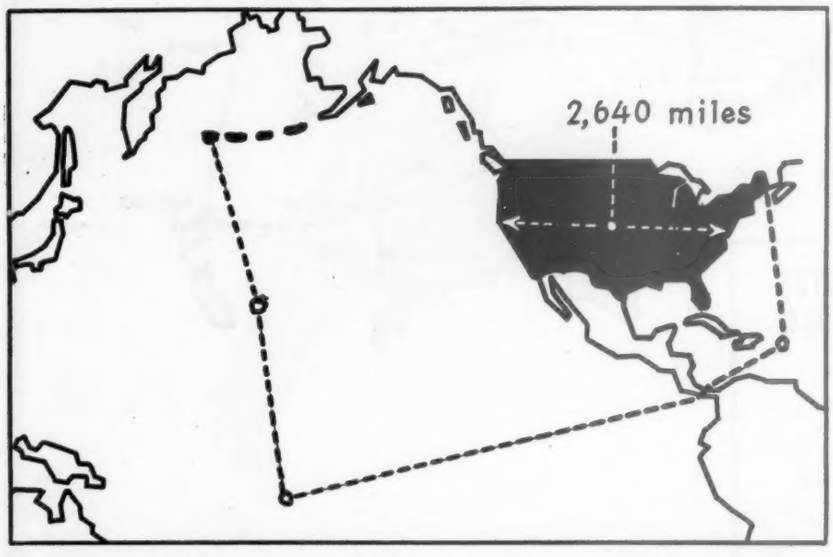
But heavily subsidized foreign competitors challenge our leadership

OUR AIR DEFENSES

Yet we lag behind our already obsolete programs



In Europe: Air power already runs the show. No city is safe against air attack; most are within bombing range of at least three potential enemies. Italy thumbs its nose at the British fleet. Germany walks into Austria. And they get away with it largely because Britain's new air force is not yet ready; France's air supremacy has slipped into limbo. England's compact insularity—once her strength—has become a major strategic weakness.



In America: No city yet lies within bombing range of a conceivable attacking country. Some day we must cope with planes which can cross and re-cross our protecting oceans. Without a top-notch American navy and air force, plane-carriers might even now launch attacks from off our coast s. But that is hardly—yet—the problem. What is important is that a proper air strength to match the force of any other power would make this country invulnerable by land and by sea, as well as by air and insure us respect throughout the world. At a time when might has taken sole control of international destinies, an inferior air force is an invitation to endless agressions.

NO ONE CAN SOUNDLY CRITICIZE the quality or performance of the aircraft now being procured for the armed forces of the United States. Type for type, they match the best in the aerial forces of Great Britain, Germany, Italy and France. They are unquestionably superior to those of all other nations. In some classes—attack, long range bombing, long range patrol, to name a few—American aircraft have no equal.

Anyone can wonder at the tortoise-like speed at which our air strength has been increasing. As long ago as 1926 the Morrow Board recommended the vigorous increase of our effective aircraft. The Baker Board subsequently set a definite goal of 2320 planes for the Air Corps. The Navy decided it needed 1800 to 2000. Five year procurement plans have been set up, adjusted, revamped. Each winter testimony at congressional hearings lays out reassuring data about great fleets of "planes on order" that will put the services within a few hundred planes of their objectives. But each year following the "planes on hand" are once more disappointing.

We have never in over a decade's trying even come within shooting distance of 4000 total aircraft. The figure in fact is still little more than half that.

Part of the trouble came from a technological revolution which four or five years ago swept out the fabric-covered biplane types which made up the bulk of all military equipment. In any period the obsolescence of types is hastened by swift progress of design. Some of the lagging can be traced to procurement systems which make the progress of any plane from designing board to service squadrons a three-year process.

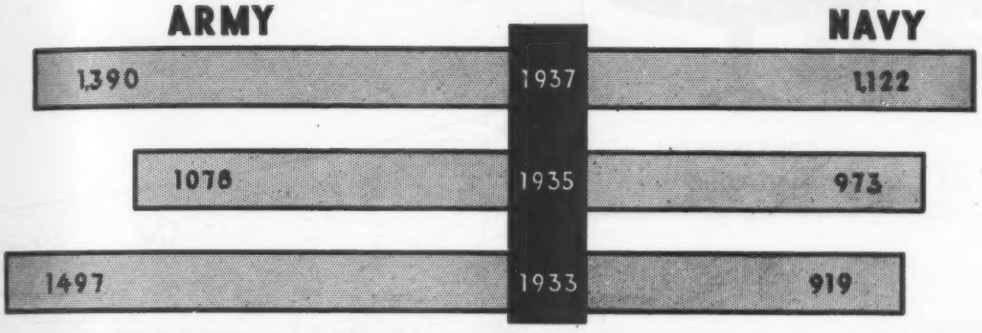
Somewhere, however, the basic explanation must lie in a psychological inertia such as let Great Britain lag in the air power doldrums until blasted into action by the creation of a superior German and Italian power.

We are still worrying about catching up to our decade-old concepts of a proper air strength. Not a power in Europe but has doubled and redoubled its airplanes of 1928. We need a modern and realistic estimate of our defense needs.

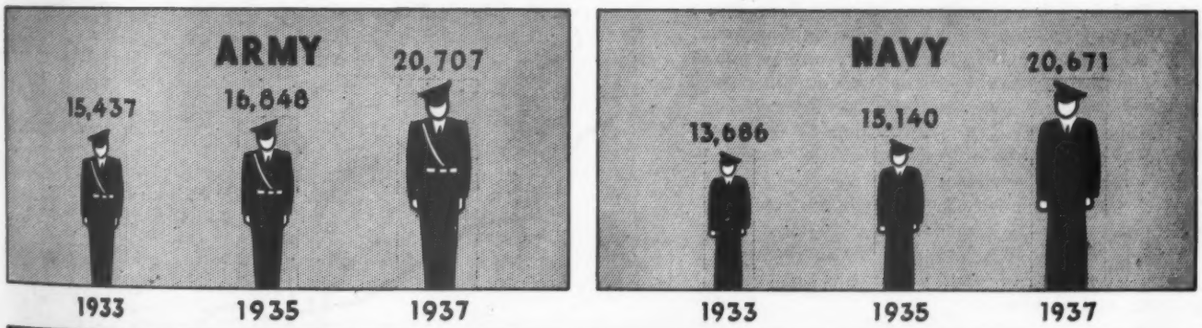
GAIN IN EFFICIENCY

while the rest of the world races madly ahead

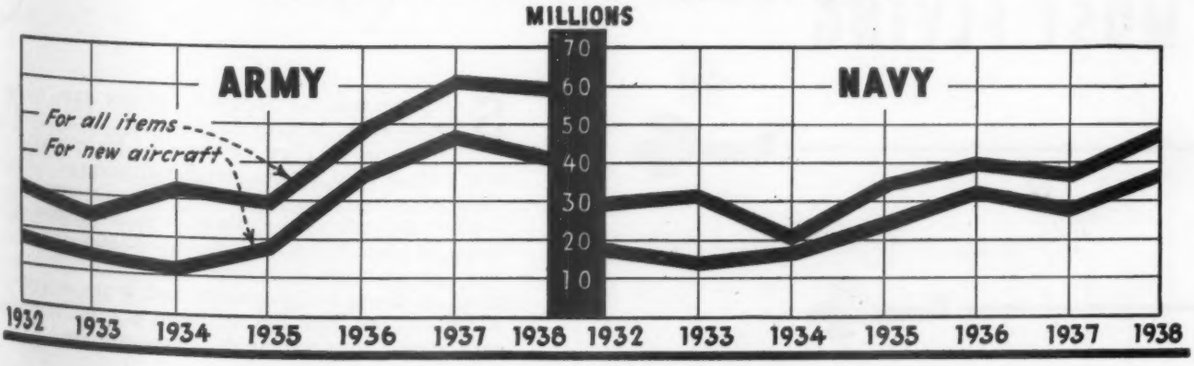
AIRPLANES ON HAND



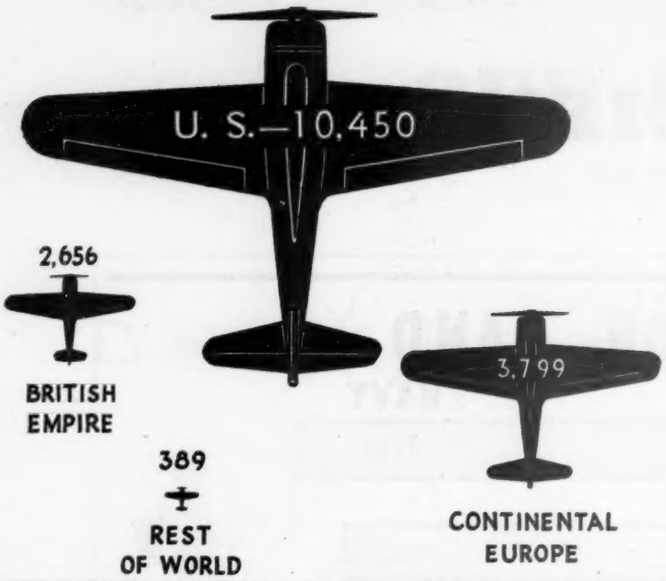
TOTAL AVIATION PERSONNEL



AIR APPROPRIATIONS



MOST PLANES

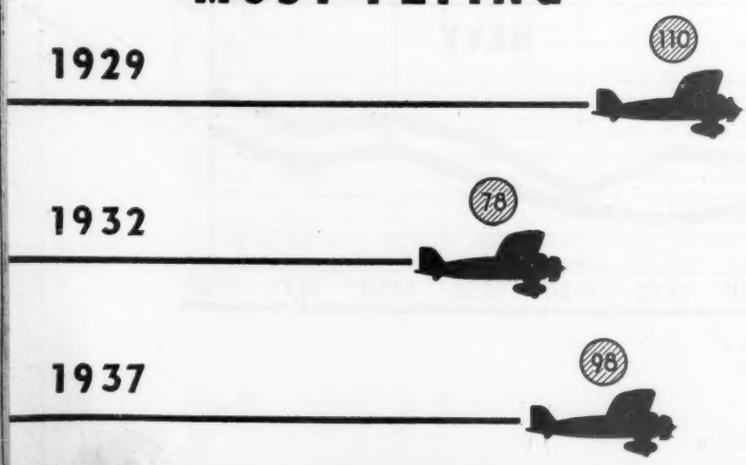


OUR PRIVATE F

Yet non-scheduled aviation still

SCATTERED THROUGHOUT THE UNITED STATES are 2,299 airports. A few of these serve almost exclusively as airline terminals; 283 are "intermediate fields" constructed and maintained for emergency use along the airways. Eighty-seven are military or naval bases. All the rest are run or shared by so-called fixed base operators. Most of them give flying lessons; sell short airplane hops; maintain a charter taxi service; sell planes; carry out airplane repairs and maintenance; sell fuel and supplies and rent hangar space. Some do aerial photography or crop dusting. Every last one of them is a focal center of local air activities. But as the development of public roads provided places for the motorist to go, so the number of airports must increase to furnish places for the airplane pilot to land. Municipalities are unwilling to bear the entire burden. When relief funds run out it must be shared by the city, state, and nation.

MOST FLYING



STATISTICIANS ARE PRONE TO SWAMP THIS PART OF AVIATION beneath the astronomical bulk of automobile statistics. They might more fairly and favorably compare it to our small-boat industry. Its importance in its own right lies in the opportunities it offers the individual to share in the sheer sport of flying, to adopt flying to his travel and business needs; to prepare himself for a career in aviation. In this group of flyers and mechanics and in the industry which supplies them lies the germ of a use of aircraft greater than we can at present conceive.

FLYERS LEAD

remains the family step-child

MOST PILOTS

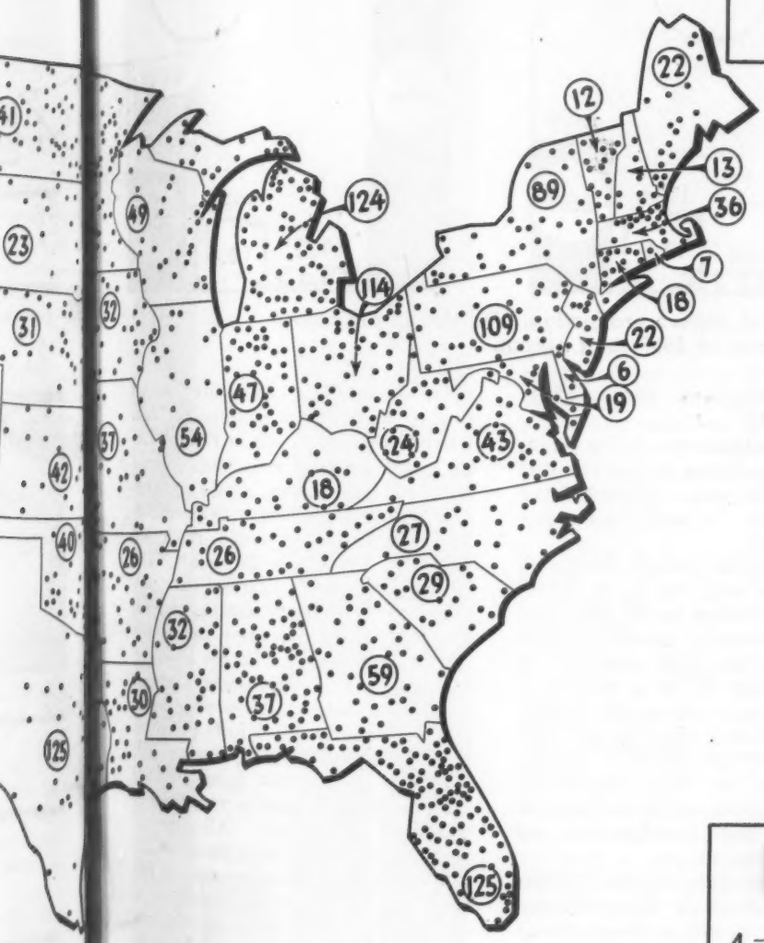
16,344

6,128 hold commercial ratings
971 hold limited – commercial ratings
8,604 hold private certificates
631 fly as "amateurs"

494 are women

not counted:
1,347 airline pilots
161 glider pilots

30,000 MORE ARE TAKING FLYING LESSONS

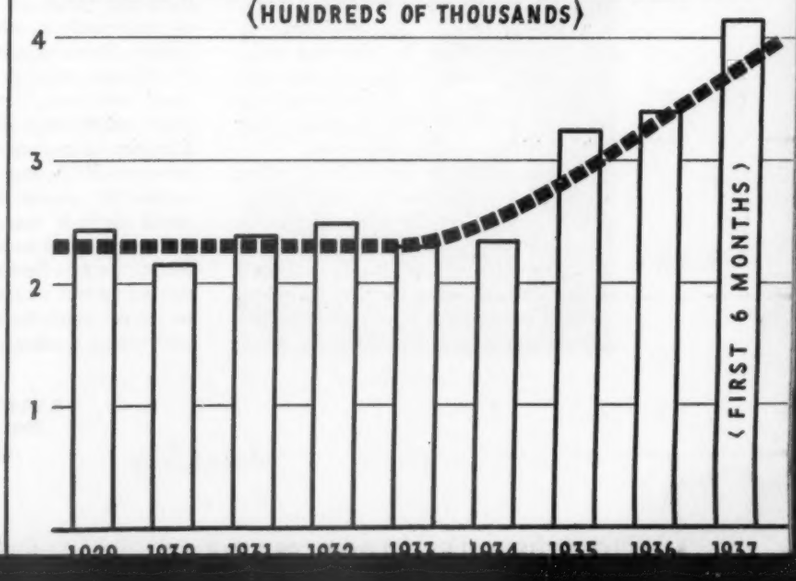


WHAT HAS THE AMERICAN GOVERNMENT DONE for this phase of aviation? In 1927 the Air Commerce Act produced a set of regulations for it that undoubtedly led toward a widespread increase in safety. A few years ago the Bureau of Air Commerce sponsored a number of attempts at the "fool-proof" light plane, a program that has now been abandoned. Last fall the Bureau issued a new and bulky Code of Civil Regulations. Among other things the CAR drastically curtails non-scheduled flying in the neighborhood of the airways. Fixed base operators also find their potential students and plane purchasers overwhelmed by its volume and its complex organization. On the positive side is the splendid program of airport projects (to the tune of $80,000,000) carried out by the WPA. Hardly one of them but has improved some local operator's prospects or made airline flying safer.

AMERICAN PEACE TIME MILITARY AUTHORITIES are prone to pass these civil airmen over as unimportant as a military reserve. Yet any air power in Europe would give its eye teeth for half as many flyers already passed through the vital first phases of their training. Nor would a European overlook their planes and airports as quickly-adaptable to primary wartime instruction uses. Ever since the Armistice, the countries of Europe have in fact fostered flying clubs, schools, even private plane purchases with substantial subsidies.

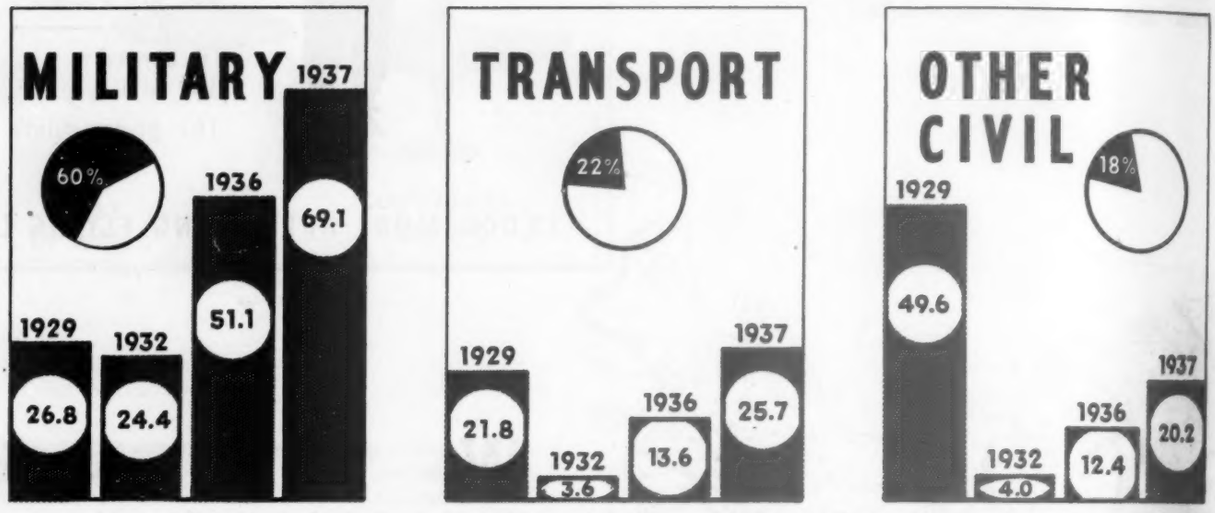
MILES FLOWN PER FATALITY

(HUNDREDS OF THOUSANDS)



OUR OUTPUT HITS NEW

But fluctuations in home and foreign markets hamper long-range



Figures on bars represent millions of dollars production. Figures in pie charts represent percent of 1937 total output.

THE AMERICAN AIRCRAFT INDUSTRY turned out 949 military airplanes last year. That was a mark almost 200 below the figure for 1936, but the dollar value of the 1937 product was more than $9,000,000 higher. Such is one trend. It is due not to higher contract prices for comparable equipment, but to the increasing stress on bigger, multi-engined, completely equipped aircraft in our services.

All Air Corps' production contracts were spread among ten plane and three engine manufacturers. The Navy's contracts were spread at eight factories and two engine plants. Each one of the plants involved increased its floor space, its production machinery, its research facilities. Only two newcomers appeared in the field who seemed certain to win a share of our military and naval business. Such is a second trend. So specialized is this manufacturing, so high the technical skill required, that it becomes more and more difficult to spread the work to small aircraft manufacturing units with uncertain resources.

This must not be lost sight of when planning for possible war emergency. An attempt to set the American automobile industry to building aircraft produced one of the major scandals of our World War history. Modern aircraft and aircraft engines are infinitely more complex than the products we attempted so unsuccessfully to build in 1918.

All the manufacturers in the large-unit group who have so far reported made profits last year. A few declared small dividends, in many cases their first on record.

They made little enough though on their business with the U. S. Army and Navy. A bidder for an Air Corps contract must actually submit a finished airplane with his price schedule. It might have cost up to a million to develop. He may not receive a dime. The Navy chooses after design competitions which are less of a gamble. But thereafter the Navy rigidly enforces a limitation of 10 per cent on profits for both development and production contracts.

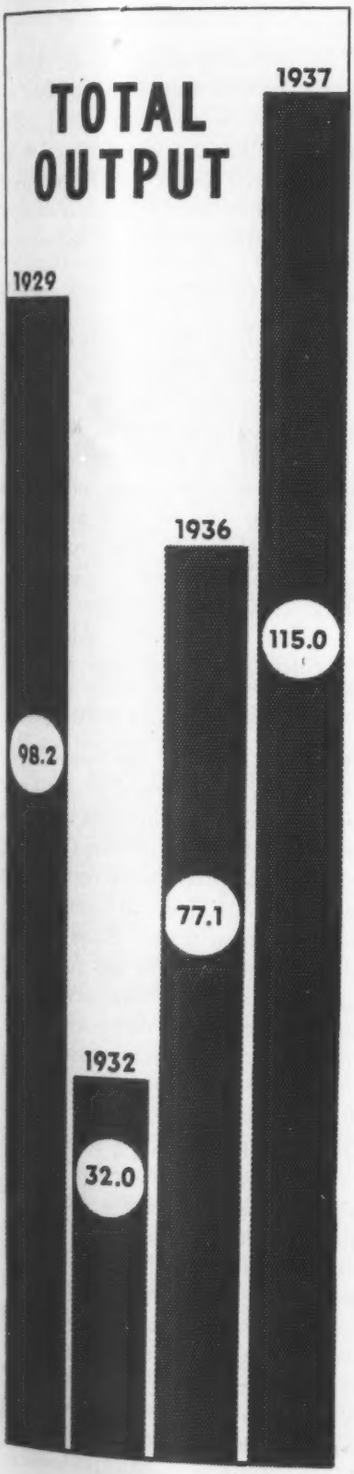
Last summer Rear Admiral Arthur B. Cook, Chief of the Naval Bureau of Aeronautics, told a House Naval Affairs Sub-committee that because of the 10 per cent profits limitation on naval contracts, fewer manufacturers were submitting designs in competition for experimental aircraft; that between 1927 and 1933 the average profit on production contracts for naval aircraft was 8.0 per cent; the average loss on experimental contracts 34 per cent. Between 1934 and 1936 average profit on production orders fell to 2.8 per cent, the average loss on experimental work rising to 71 per cent.

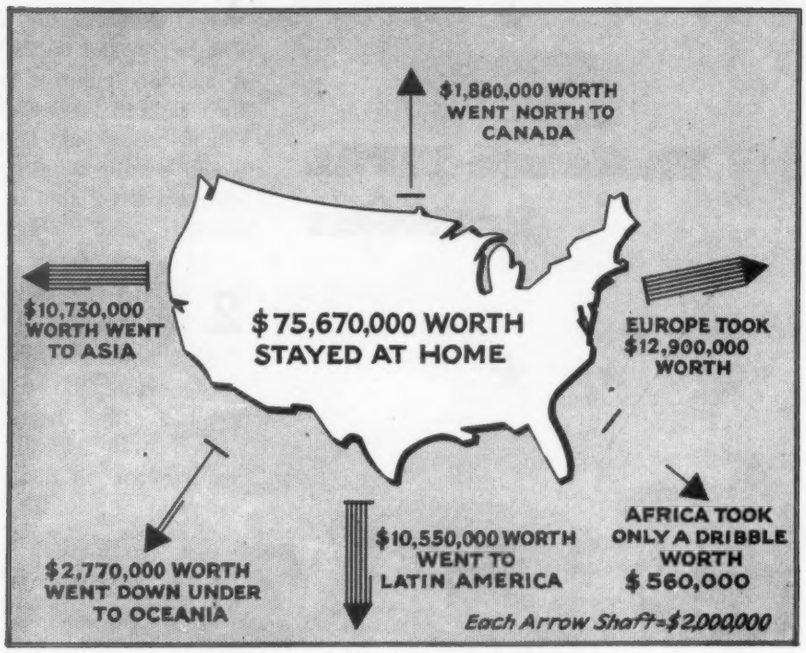
The country's transport output stepped up an even hundred per cent from 94 in 1936 to 188 in 1937. Without exception they were multi-engined all-metal monoplanes whose performance would have been unbelievable in 1930. The fastest could reach top speeds of more than 250 m.p.h. The largest landplanes carried 21 passengers. The most luxurious offered sleeping berths and every conceivable travel convenience. To the engineer, however, 1937 transport interest centered upon production progress of the big Douglas DC-4 forty passenger liner; the almost as big Boeing 307; the huge Boeing 314 flying boat due for transoceanic service with loads of two-score passengers. All three of these big ships will be in the air within a few months. The first units of this trio will represent an aggregate of more than $2,000,000 of air line and manufacturers' investment. As in no other important air nation these represent not a single cent of governmental subsidy.

The industry's largest domestic increase came in sales of single aircraft for sport and business use. Within this group the small two-place monoplane again stood out. Total sales in the whole group were 2,050 as against 1,434 in 1936. Of the 2,050 no less than 1,542 were of the so-called light plane class.

HIGH

planning.




$1,880,000 WORTH WENT NORTH TO CANADA
$10,730,000 WORTH WENT TO ASIA
$75,670,000 WORTH STAYED AT HOME
EUROPE TOOK $12,900,000 WORTH
$2,770,000 WORTH WENT DOWN UNDER TO OCEANIA
$10,550,000 WORTH WENT TO LATIN AMERICA
AFRICA TOOK ONLY A DRIBBLE WORTH $560,000
Each Arrow Shaft=$2,000,000

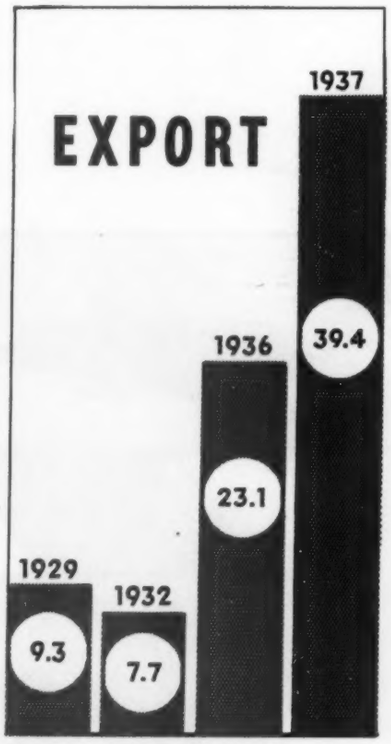
IF ANY TESTIMONIAL WERE NEEDED as to the quality of American aircraft and the efficiency of American production one lies here at hand in the figures of last year's aircraft exports. No such achievement has ever been previously recorded by the aircraft industry of any nation. No other country even approached it in 1937.

Of interest is our list of best customers:

Argentina	$4,403,500
China	3,961,800
U.S.S.R.	3,212,700
Netherlands	2,954,400
Japan	2,483,900
Turkey	2,450,400
Mexico	1,921,400
Canada	1,854,700
United Kingdom	1,729,300
Brazil	1,675,092

Landplanes, 593 of them, accounted for $17,641,764 of the export total. Thirty-three amphibians brought $3,385,597. Engines brought $5,944,004 for 1,047 units. Instruments and other accessories emphasized the standing of American precision work. Their total sales abroad amounted to $12,157,337.

Last year this flood of export business led all other factors in putting the whole manufacturing industry on the right side of the ledger. There is no reason why under similar world conditions this country cannot continue to send abroad a substantial part of its aircraft product. Under almost any conceivable circumstances we should command a leading share. But world affairs are fickle things. A world at war. A wide spread collapse of currencies. Dumping of obsolescent military equipment from Europe (already begun). All these things might cut us off from this valuable outlet. It would be better if our home markets could be put on a permanently profitable footing.



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These are VITAL Problems

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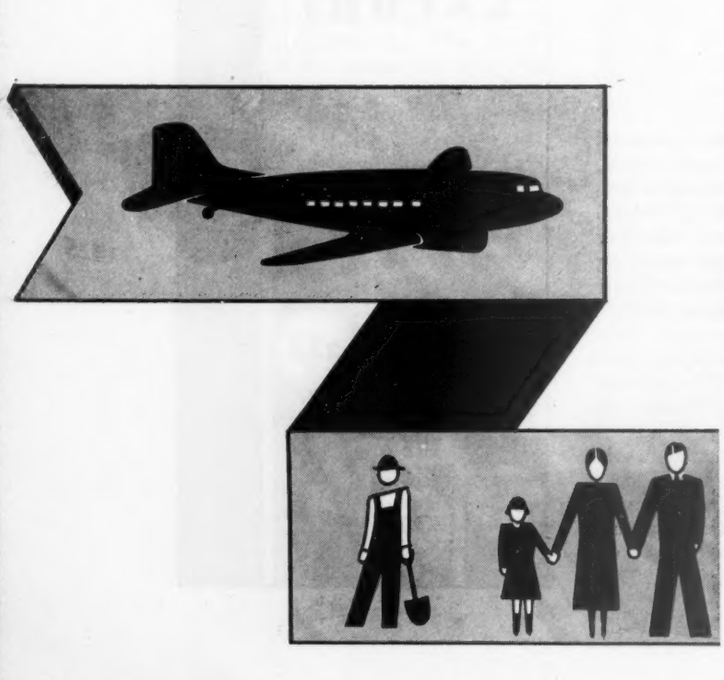

1. DOMESTIC AIR TRANSPORT has too many fingers in its particular pie—the Post Office, the Department of Commerce, and the ICC. It still suffers under legislation that is basically punitive rather than constructive. Airlines, once their right to operate as a "convenience and a necessity" has been established, should be granted rates for services rendered that would permit a fair profit. Cut-throat competition must be eliminated. Complete cooperation is absolutely indispensable for safety and for the nation-wide promotion of air travel.

2. WORLD AIR ROUTES operating under the U. S. flag face competition from the heavily subsidized airlines of foreign powers which becomes more intense with each passing season. Here, too, a division of authority among Post Office, Commerce, and the State Departments detracts from progress. Our rivals realistically recognize the prime importance of such air transport in their drive for national prestige, for export markets, for political alliances.

3. NATIONAL AIR DEFENSE is suffering from a lack of appreciation of the fact that the airplane offers the most economical and the most effective weapon for our territorial protection. Army and Navy air programs must be overhauled and coordinated. Experts must make a realistic estimate of the minimum air defense requirements in planes and personnel *in the light of present world conditions*, and we must build up to that minimum in the shortest possible time. The procurement policies of the two services must be geared more closely to the problems of the manufacturers. The productive capacity of our plants must be maintained against emergencies. Also, closer cooperation must be maintained between Service and Civil aviation.

4. NON-SCHEDULED OPERATORS are resentful of the new regulations issued by the Bureau of Air Commerce. They feel that they are being discriminated against in favor of air transport. They think that their problems are being overlooked in pending legislation, that proposals to require radio in all aircraft and to rule the private flyer off principal airports will work unjust hardships upon them. Some form of direct governmental assistance for flying clubs and for schools on the European plan may be desirable. Necessary for the immediate future is a sympathetic and constructive approach to the problems of this group. Its importance must not be minimized.

5. AIRCRAFT MANUFACTURERS as a group have had a hard row to hoe. Lack of coordination of military procurement policies has always made for feast-or-famine production with subsequent violent fluctuations in demand for labor and materials. Over-severe restrictions have made the earning of even modest profits difficult in nine out of ten government projects. The manufacturing industry needs stability, and an opportunity to plan for orderly and efficient development of facilities for both ordinary and emergency conditions. The U.S. is the only air power which gives its airlines no financial assistance in costly process of developing new equipment. The U.S. gives little consistent help to its small plane manufacturers with experiment in government laboratories.

THREE YEARS AGO there was a strong feeling in most branches of the aviation industry that many of the difficulties in which it was then involved could be solved by the creation of some form of permanent authority or commission of a non political character with broad powers to regulate all civil aeronautics, particularly all domestic and foreign air transport. Not that the creation of a Commission would be an answer in itself, but it seemed the first and most necessary step toward the establishment of a long-range constructive program for the development of our aviation.

If the time for such action seemed ripe in 1935, certainly there can be little question of its absolute necessity now. The developments of the intervening three years have multiplied, not diminished aviation's problems. Clearly, as a study of the preceding pages must show, it is a business that is growing no simpler fast. Its complications are so intricate, and its ramifications so far reaching, that the only hope for continued progress is in the establishment of some centralized authority to coordinate its activities and to shape its destinies.

Other countries have established one-man dictatorships to control aviation, or have taken over their aircraft industries lock, stock and barrel, to insure concerted action toward a common goal. But that is not the American way. We want no dictators, nor do we want nationalization. We believe in the democratic principal of individual enterprise engaged in freely competitive markets. But, for an industry that is as complicated and is as closely related to the public interest as aviation, we feel that the necessary directional stability can best be secured by turning over the controls to a duly appointed Authority made up of personnel highly competent in aviation affairs.

Pending before the Congress at the moment are two bills, differing somewhat in detail but agreeing in principle on the establishment of a centralized aviation authority. Both the Lea bill and the McCarran bill cover not only air transport, but provide for the regulation and coordination of all civil aviation activities, including those functions now handled by the Department of Commerce.

The differences between the two bills are, from the point of view of the aviation industry, minor. They concern chiefly matters of jurisdiction and administration. Rumors are current that passage this session may be jeopardized by bickering between the executive and the legislative departments, and that certain opponents of one or the other bill might throw monkey-wrenches into the machinery on general principles.

But, if the facts presented herein concerning this aviation industry have been properly read and properly understood, it should be very clear that now, if ever, is the time to forget about minor jurisdictional differences between this group or that, and to drop any ideas of using aviation as a guinea pig to see how far this faction or that can get in fighting out the government reorganization issue. Aviation NEEDS this constructive legislation and needs it NOW. On the part of the aviation industry we urge the Congress to exert all possible effort immediately toward pushing the two bills through the respective houses, getting them into conference for reconciliation, and onto the President's desk for signature. The more quickly this can be accomplished, the sooner aviation will be free to take off toward bigger and better things unhampered by further uncertainties and by further petty political finegling.

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Here is a PRACTICAL Solution

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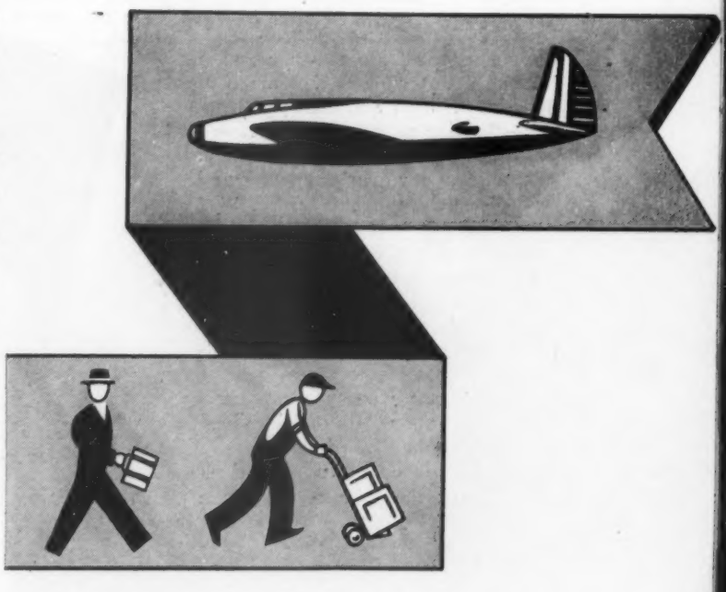


H. D. Ingalls, Maintenance Superintendent, (left) receives AVIATION'S Maintenance Award from the editor of AVIATION at the recent Dallas maintenance meeting.

It's the Little Things that Count

American Airlines' system of "prophylactic maintenance" is based on constant attention to a host of minute details. Every man in the organization keeps his finger on the operating pulse to detect the slightest irregularity and to apply corrective measures before trouble can start.

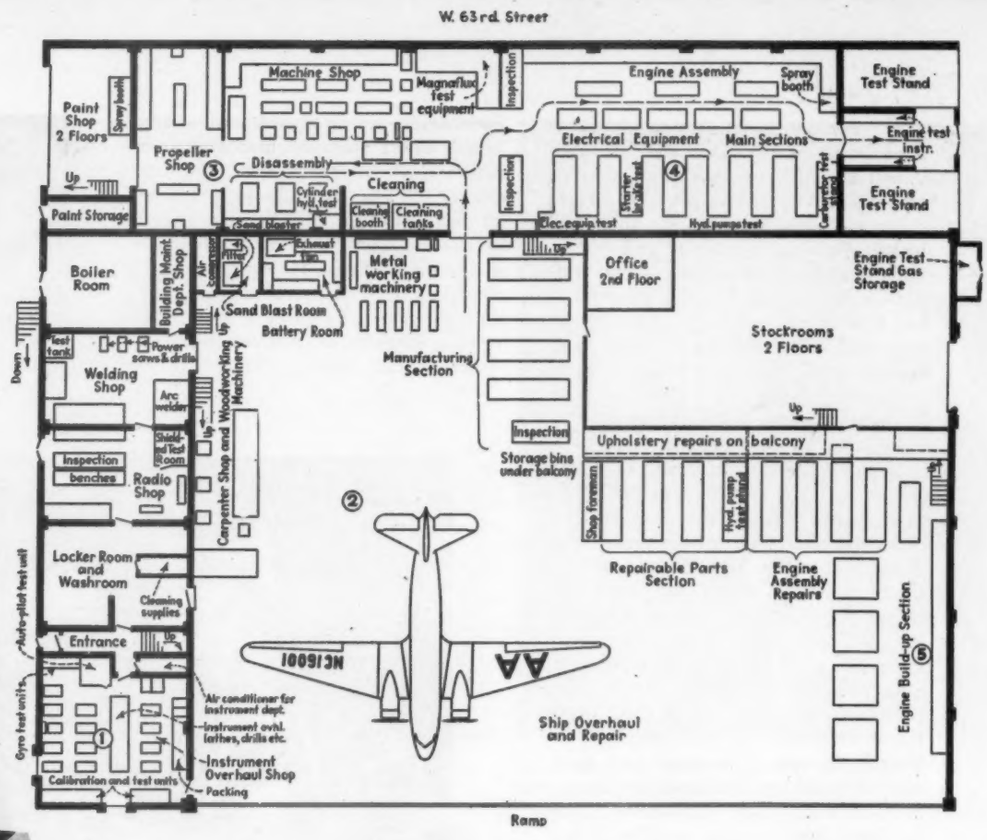
IF YOU TAKE the ten-thousand-and-one assorted parts that make up a modern air liner and multiply them by 45,—the size of American's active flying fleet,—then fly that fleet some 50,000 miles a day over a network of airways stretching from Boston to Los Angeles, you will begin to get some conception of the problem that faces any airline that operates on a transcontinental basis. The astonishingly high standards of safety, regularity and all-round performance that have been set in the past few years stand as a tribute to the men who are charged with the responsibility of keeping the complex mechanism of the modern airplane in safe operating condition.

Although the primary obligation of maintenance is toward the safety of passengers and crews, the protection of a heavy investment is also in the hands of the mechanical departments. American Airlines' flying fleet represents an original investment of upwards of five and a half million dollars; and the current inventory of spare parts and supplies needed to carry on operations runs close to $750,000 (including an average of about $30,000 worth of gasoline on hand, and some $5000 for oils and greases). Clearly, then, neither haste nor waste may be tolerated in operating or maintenance, and the importance of attention to even the most minute detail becomes apparent.

In order to keep track of details in daily operation, American has developed an elaborate system of record keeping based on pilots' flight logs and on the inspection reports originating at terminal or intermediate ground stations. Even the slightest irregularity of functioning of any part of the equipment must be recorded on appropriate forms (together with the corrective measures that have been applied) and immediately forwarded to Chicago.

(*Turn to page* 36)

Propellers are completely overhauled at every engine change.



The instrument shop is completely air-conditioned, is fitted up for the overhaul of everything from temperature gages to automatic pilots.

No space is wasted in the layout of the efficient Chicago overhaul base. Line servicing is done in an adjacent hangar. (see frontispiece)

Key numbers on plan refer to photographs on these pages

Airplane overhaul occupies the central hangar space.

After tear-down and cleaning, every part of every engine is subjected to microscopic examination. After overhaul the Wright Cyclones and all accessories are assembled on mounts to be swung into ships as units.

A very complete equipment log is maintained in Chicago with an individual card for every single piece of equipment (by serial number), right down to items as small as individual instruments, individual vacuum pumps, individual fuel pumps, etc. From this record can be seen at a glance the entire history of each piece of equipment showing from whom and when purchased, total active life to date, when and what troubles have occurred with it, on which ship it is fitted at the moment, and its final disposition.

Very close cooperation is maintained among the Operations Department, the Maintenance Department and the Engineering Department. Every two weeks equipment log reports are analyzed in detail and a report submitted to the superintendent of maintenance with copies to the operations department, the treasury department, the engineering department and to the maintenance supervisors in the five areas whose headquarters are Glendale, Fort Worth, Chicago, Cleveland and Newark. Attached to this analysis is a report showing what corrective action has been taken on the troubles listed. Thus everyone from the mechanics out on the line to the top executives are kept informed constantly of the cause and cure of mechanical trouble.

Further, every year all the bi-weekly summaries are analyzed and a combined report showing mechanical difficulties which have been eliminated during the year is made up. Although all this entails a considerable amount of clerical work, both in the field and in the main offices, American Airlines considers it well worth the effort in their program of greater safety by preventive methods of maintenance.

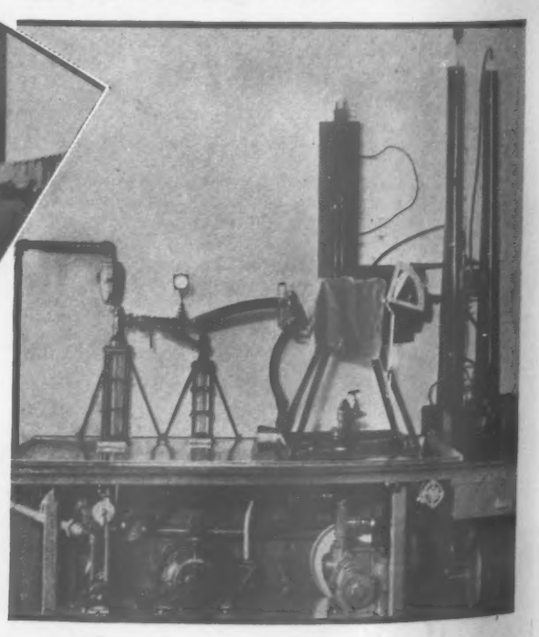
But Ralph Damon, American Air

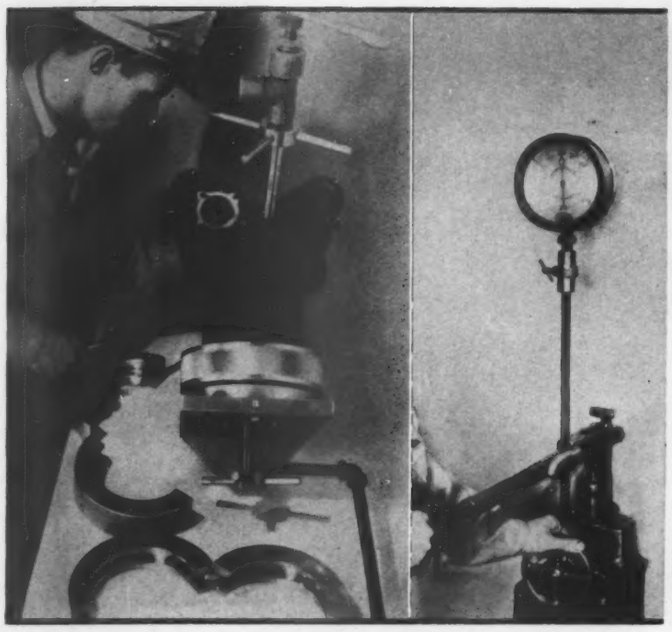
Bill Pratt checks out a heating boiler on a set-up simulating actual conditions in a DC-3. Pressure regulator valve, pressure relief valve, Hoffman air vents, and the nacelle-relief valve may be checked.

By means of this auxiliary cylinder the operation of controllable propellers may be checked on the assembly stand. W. J. Binard shows how it works.

Every steel part from engines and propellers is checked for soundness on the Magnaflux machine at every overhaul period.

This laboratory set-up checks the proper functioning of all Chandler-Groves carburetors before installation.





Bill Eliott checks an engine cylinder for soundness by applying 2500-lb. per sq.in. pressure in a "bomb" rig.

For drilling out valve guides, the fixture used here by H. Keating has saved many dollars.

Latest addition to A.A.'s shop equipment is this Waddell valve seat re-facer.

Ed Dulin prepares to lap in a set of piston rings in the ring grooves in a dummy cylinder. After this operation, rings are lapped by hand into cylinder in which they are to work, an operation that has saved a great deal by reducing oil consumption and in keeping engines free from sludge.

All hydraulic units may be set up on this test panel to check operations of landing gear, wing flaps, etc. Here Aron Yellott is "giving the works" to a set of valves and pumps from a DC-3.

lines' energetic vice-president in charge of operations, is not content to wait for the bi-monthly analyses. On his desk every morning is placed a summary of all irregularities of operation for the entire system for the preceding 24 hours (from 6 A.M. to 6 A.M. Central Standard Time). Any sort of irregularity which results in a delay at any starting point or intermediate station of over 15 minutes or a delayed arrival at a terminal station of over one hour is noted on his report. Where any flight passes up a scheduled stop or makes an unscheduled landing for whatever reason, the details are given. As a matter of fact, every scheduled flight is listed on the report, and where schedules are completed without irregularities, the fact is noted by a symbol. These reports are accumulated by the flight superintendent at the five flight control points and are relayed to the Chicago office in the early hours of the morning in time to be typed and put on Damon's desk for consideration as the first item of the day's business. It is only through the meticulous attention to every single detail, no matter how small, that a modern airline may be run with safety and economy, and it is a lot of credit to Hugh Smith, American's operations manager and his flying and dispatching personnel, as well as the maintenance department men the irregularity summary is generally as small as it is.

This constant dissemination of essential information is but one cog in the efficient machine for the maintenance of airplanes and engines that American Airlines has built up at its Chicago headquarters. Another important department is the engineering department whose chief function is not only to develop and specify new flying and ground equipment for the whole system, but also to coordinate and to standardize maintenance and

(*Turn to page* 70)

Boeing's STRATOLINER

Preview of a high-level transport of which first production models are to go to PAA and TWA.

BOEING AIRPLANE COMPANY has registered the name "Stratoliner" as a trade mark for its 4-engined 307-type transport, the world's first large airliner actually constructed with stratosphere-type cabin for high level operation. The ship will have a fuselage with circular cross section throughout its entire length, without the usual protrusion of cockpit windows. In operation up to 20,000 feet above sea level, these planes will carry thirty-three passengers by day or twenty-five in berths at night. They will be operated by a crew of four or five, will have capacity for two tons of mail and air express. Powered by four 1100 horsepower Wright Cyclone engines, they are designed to reach a top speed of more than four miles per minute at 8,000 feet.

Nine of the 307 transports are in production at the Boeing factory, the first ones rapidly nearing completion. The first two will be delivered to Pan American Airways equipped with complete "altitude conditioning" apparatus for upper level flight. Other planes of the series, including six for Transcontinental & Western Air and one additional for Pan American, will be identically designed and constructed so that cabin supercharging equipment may be installed following tests.

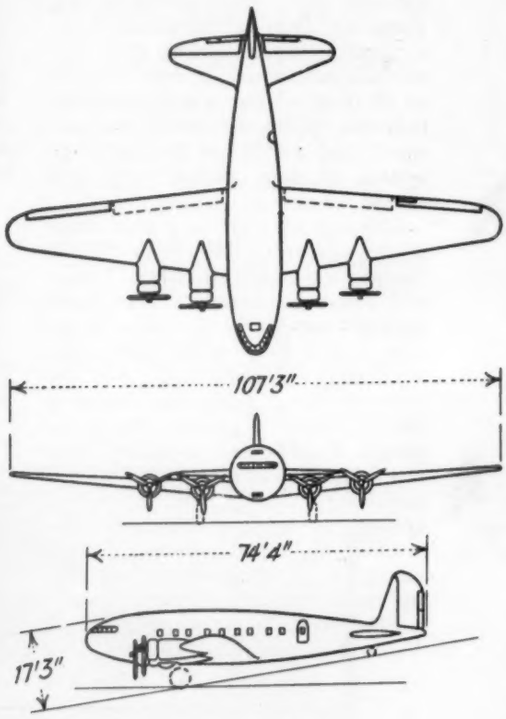
Actually, the designed flight path will be in the troposphere, below the true stratosphere, where it is possible to get most of the benefits of high altitudes without getting into the complex problems of flight in the extremely rare atmosphere and low temperature (65 degrees below zero, Fahrenheit) of the true stratosphere. On 2500 horsepower, performance estimates indicate, the ship will cruise at 240 m.p.h. at designed cruising levels. Mechanical superchargers and pressure regulating apparatus will preserve automatically the proper pressure inside the cabin regardless of outside pressure (within reasonable limits). Ascending or descending, the pressure-regulating equipment will automatically reduce the apparent change of altitude inside the cabin so that a rate of 565 feet per minute may be maintained all the way from 15,000 feet to sea level, but cabin pressure will change only at the rate of 300 feet per minute.

The Stratoliner, an all-metal low-wing monoplane, has a fuselage of semi-monocoque construction, wings of the Boeing combination truss and stressed-skin type, electrically operated wing flaps, cantilever tail surfaces with a single vertical fin, fully retracting landing and tail gear (electrically

operated), and hydraulic brakes.

The cabin, including its cylindrical walls, windows, doors, and fittings where controls pass through the outer shell, is constructed to withstand a pressure differential of six pounds per square inch between inside and outside air. The plane will be operated with a pressure differential of only two and one-half pounds per square inch, however, sufficient to keep the apparent cabin altitude at 8,000 feet when the plane is actually 14,700 feet high, and at 12,200 feet when the plane is 20,000 feet high.

There are two fully independent supercharging and heating installations, either of which is capable of handling the entire job alone. Drawn through the leading edge of each wing, fresh air will be compressed in engine-driven superchargers and circulated throughout the cabin after being heated by means of freeze-proof condenser type steam radiators. The air will be conducted directly into the cabin ventilating system, so that individually controlled ventilators at passenger seats will supply the same "conditioned air" as the general circulation vents. The spent air will be discharged through an exhaust chamber below deck.

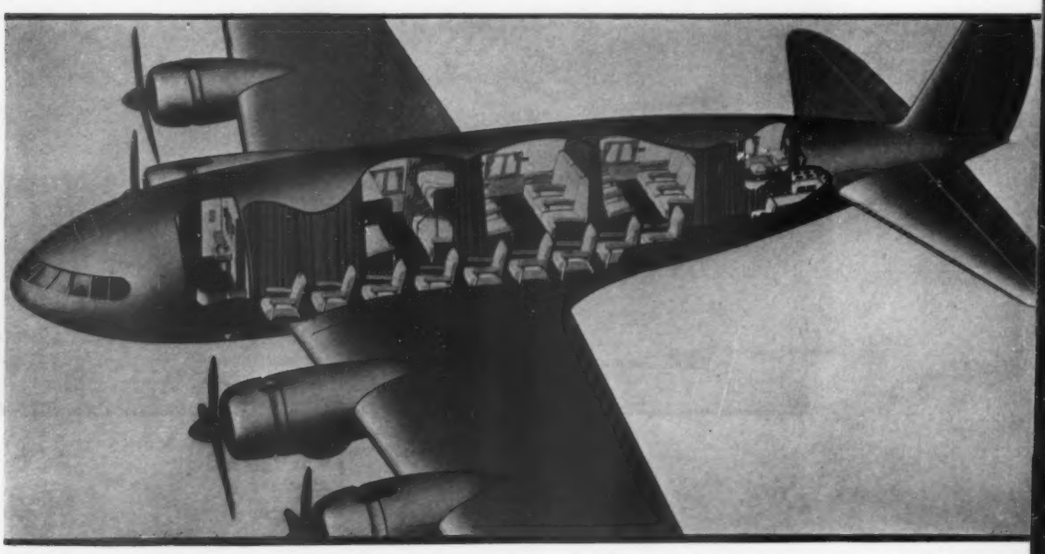


Top: Control room of the Stratoliner. Note seat desk for third crew member. This is the TWA arrangement.

Below: One of the four compartments of the air conditioned cabin.

Left: A corner of the ladies' dressing room.

Right: Interior arrangement showing how compartments are arranged for sleeping. Note single chairs along port side.



Flying Equipment

TIMM 840

New feeder line ship has tricycle landing gear, hydraulic brakes, slots, flaps.

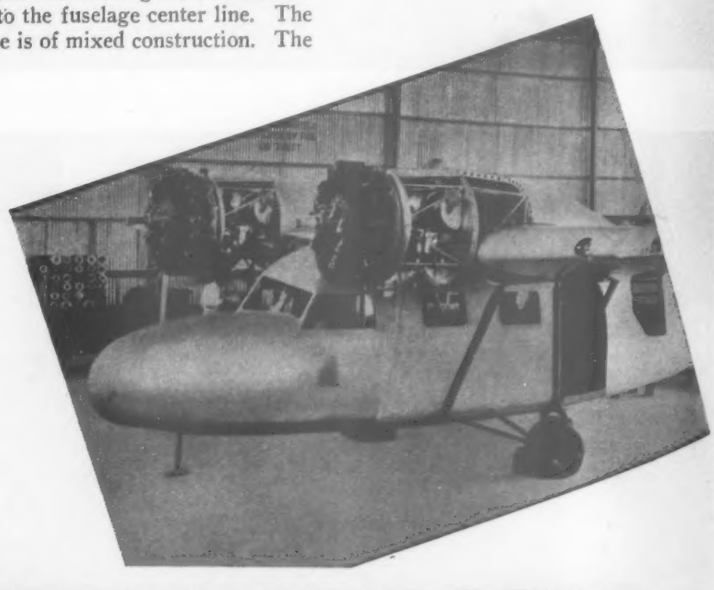
DESIGNED AND BUILT to satisfy the requirements of operators of small airlines and long-range charter equipment, as expressed through an extensive mail survey questionnaire the new Timm 840 twin engine transport incorporates tricycle landing gear with steerable nose wheel; hydraulic brakes on all three wheels; a self energizing hydraulic system for steering the nose wheel; and a complete Handley Page system of slots, slotted flaps, and slotted ailerons.

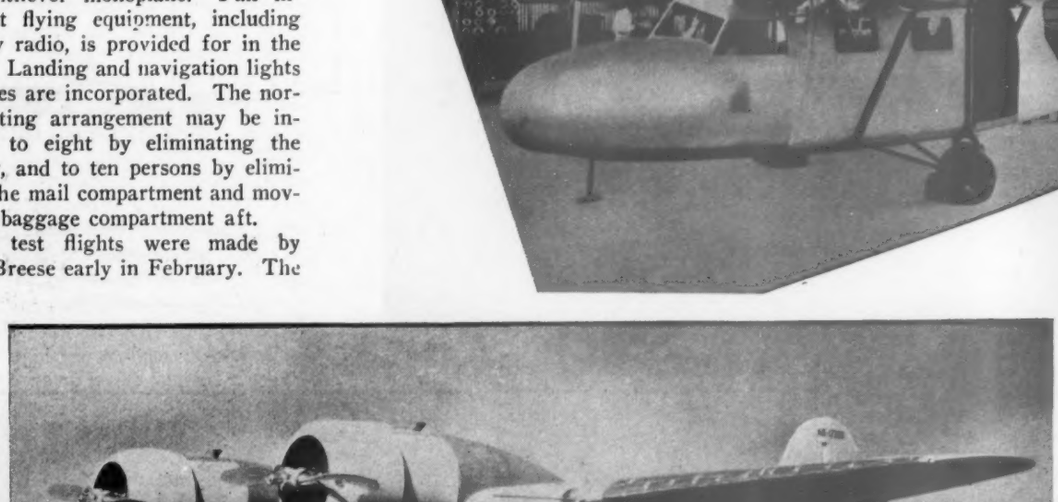
Although adaptable to a wide range of requirements, the Timm 840 is basically a six-place airplane with lavatory and cargo capacity for 180 lb. of baggage and 200 lb. of mail. In design it is a twin-engine, high wing, semi-cantilever monoplane. Full instrument flying equipment, including two-way radio, is provided for in the design. Landing and navigation lights and flares are incorporated. The normal seating arrangement may be increased to eight by eliminating the lavatory, and to ten persons by eliminating the mail compartment and moving the baggage compartment aft.

First test flights were made by Vance Breese early in February. The slot and flap system, in conjunction with the tricycle landing gear, is said to have reduced take-off run by 30 per cent and landing run by 75 per cent.

The high wing design provides excellent passenger vision, and is said to improve efficiency of propulsion, especially on one engine, through making it possible to bring the two nacelles closer to the fuselage center line. The airplane is of mixed construction. The fuselage is of steel tubing aft of the front spar, and of monocoque dural stressed skin construction forward of the spar. Engine nacelles wing stubs, and bottom of the cabin portion of the fuselage are also covered with aluminum alloy sheet. The balance of the fuselage is cloth covered, over dural stringers.

Wings are built in four sections. Each wing has a steel tube structure inboard section extending from the fuselage to and including the nacelle structure and covered with dural sheet throughout. This section is braced to the lower longeron of the fuselage by two struts. Outer wing panels are of full cantilever design attached at the nacelles, and are of wood construction, Haskelite covered. Two box type spars are used with laminated spruce caps strips and filler blocks and Haskelite plywood webs. Ribs are of spruce





Wally Timm inspecting the slot operating mechanism.

with Haskelite gussets. Balloon fabric covering finished with pigmented dope is used over the Haskelite cover.

Several coats of varnish protect the interior structure of the wing. The ailerons are built with a steel tube spar, dural ribs, and cloth covering. Flaps are of all-metal stressed-skin construction, operated by an electric motor to any degree of deflection set by the pilot. Slot sections are of metal structure and covering and are fully automatic, being mounted on rollers. Both slot and flap mechanisms are fully enclosed. Fixed tail surfaces are full cantilever, of wood construction Haskelite covered. Rudder and elevators incorporate steel torque tubes, dural ribs and fabric covering. Tabs are adjustable in flight on rudder and elevators. A controllable tab is provided on the left aileron. All control surfaces are mounted on ball bearings.

The fuselage is of pear-shaped cross-section, being wider at the bottom to give maximum passenger room. Normally there is no bulkhead between the cabin and pilot cockpit. In addition to the standard tricycle landing gear an emergency tail skid with hydraulic shock absorber is built into the rear of the fuselage. Goodyear Airwheels and brakes are used on all three wheels. Bendix oleo pneumatic shock struts are used with each wheel Tread of the landing gear is 12 ft. and wheelbase is 10 ft. 11 in. The design provides for substitution of floats or skis for the standard wheel gear. Fuel is carried in two wing tanks, one in each wing root section, providing a total capacity of 180 gal. The plane incorporates soundproofing, ventilation and heating facilities.

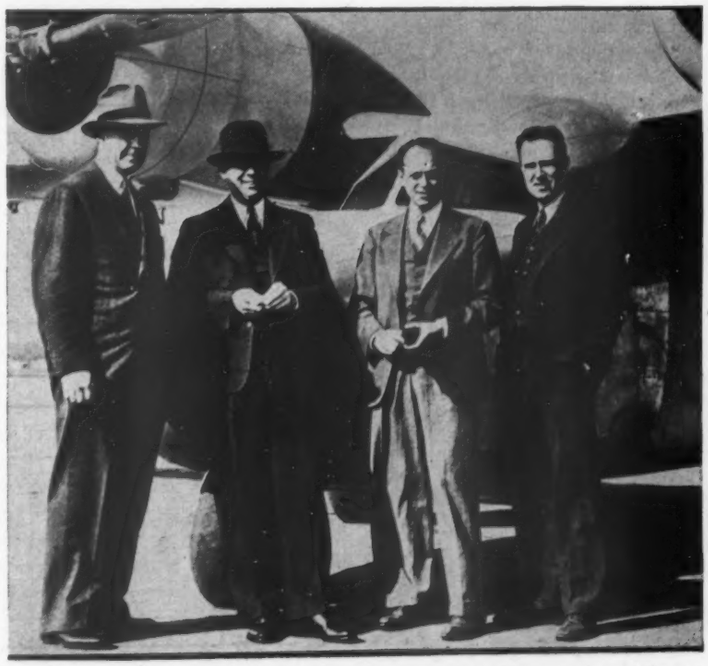
Although the Timm 840 is essentially a high speed transport (207 m.p.h.) the designers feel its chief merit lies in its safety for operation under blind flight and blind landing conditions as a result of use of slots and flaps and the three wheel landing gear. Complete lateral stability is claimed at speeds below normal level flight speed; a low sinking speed; and ability to control angle of glide over a wide range due to controllable flaps in conjunction with slots. Also, use of the slot makes practicable the highly tapered wing without suffering the penalty of tip stall danger at slow landing speeds.

A further advantage of the high wing and tricycle gear, from a maintenance standpoint, is that the propellers are kept up away from action of stones and gravel, and the tail surfaces are also high where they will not often suffer damage from brush or other minor field obstructions.

Specifications as supplied by the manufacturer:

Model: Timm 840.
Height: 12 ft. 6 in. overall.
Length: 37 ft. 6 in. overall.
Span: 50 ft.
Wing Chord: root 105 in.; max. 132 in.
Tail span: (horizontal stabilizer)—17 ft. 6 in.
Total wing area: 384 sq.ft.
Tires: nose wheel 22x10-4 Goodyear heavy duty. Main wheels 27x12-5 Goodyear heavy duty.
Brakes and wheels: Goodyear, differentially controlled.
Cargo and mail compartment: 47.8 cu.ft.
Cabin, including cockpit: 194 cu.ft.

(*Turn to page 72*)

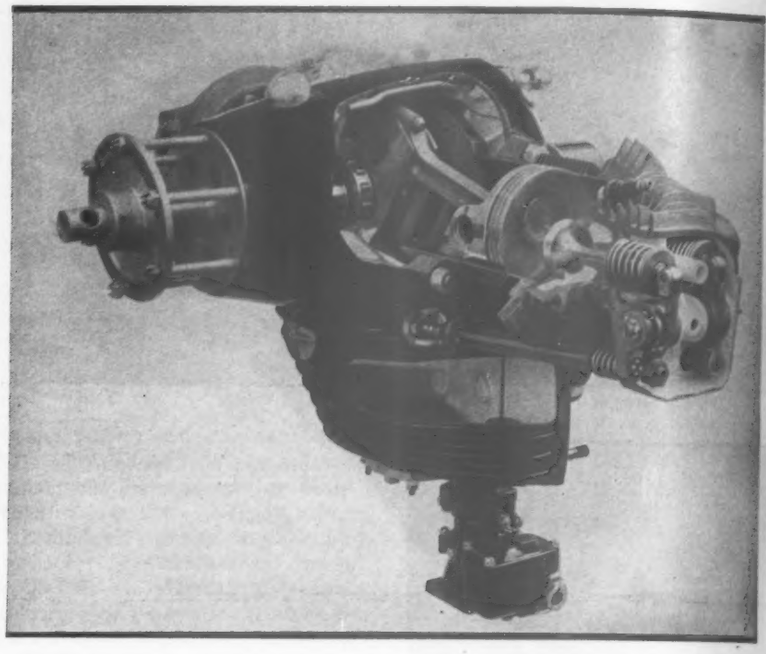


Left to right: Test Pilot Vance Breeze, General Manager Wally Timm, President Otto Timm, and Chief Engineer Howard Evans.

Flying Equipment

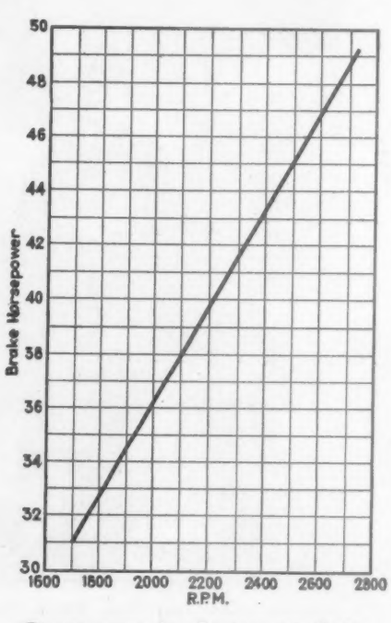
AERONCA 45 Engines

New series develops 40, 42, and 45 hp.



IN ORDER to meet increasing demands for more power in the lightplane field with a minimum of added expense the Aeronautical Corporation of America has developed the time-proved Aeronca E-113-C engine of 40 hp. at 2,540 r.p.m. into a series of models offering 40, 42, and 45 hp. respectively. The new series of engines, known as the E-113-C, E-113-CD, E-113-CB and E-113-CBD are nearly identical in general design. The E-113-C is a two cylinder opposed, four-stroke cycle air cooled engine of 113 cu.in. displacement, having a bore of 4¼ in. and stroke of 4 in. Overhead valves of austenetic steel with hardened valve-stem tips operate in aluminum bronze guides against seats of the same material shrunk into Y alloy aluminum heat treated cylinder heads. The heads are bolted with sixteen studs to a forged chrome-molybdenum steel cylinder. The two-throw crankshaft is of heat-treated 2,512 steel with hardened crankpins, and is carried on two R-140 Norma Hoffmann roller bearings. One Fafnir radial thrust bearing of deep groove type at the propeller end of the shaft carries both thrust and radial loads. The crankcase is of aluminum alloy cast in one piece and finned for cooling. Connecting rods are of I section forged steel with steel-backed cadmium silver plain bearings at the crankpin end and a phosphor-bronze bushing for the piston pin. Piston pins are of case hardened SAE 4615 steel held in the "Permite" pistons by steel snap rings. Pistons carry two compression rings and one oil control ring of ventilated type.

Lubrication is provided by a gear type pump from a three quart capacity oil reservoir in the engine crankcase. Oil is supplied under pressure to the connecting rod bearings; the balance of the engine being splash oiled. Ignition is supplied by a Robert Bosch FF-2-A series magneto driven through an impulse coupling, which insures an intense spark for easy starting. Carburetion is furnished by a 1⅛ in. NAS-2 Stromberg carburetor. An exhaust jacketed preheater is standard on all models and recommended fuel is 73 octane; all three models having the same compression ratio of 5.4 to 1. Fuel consumption is .56 lb. per b.hp. hr.



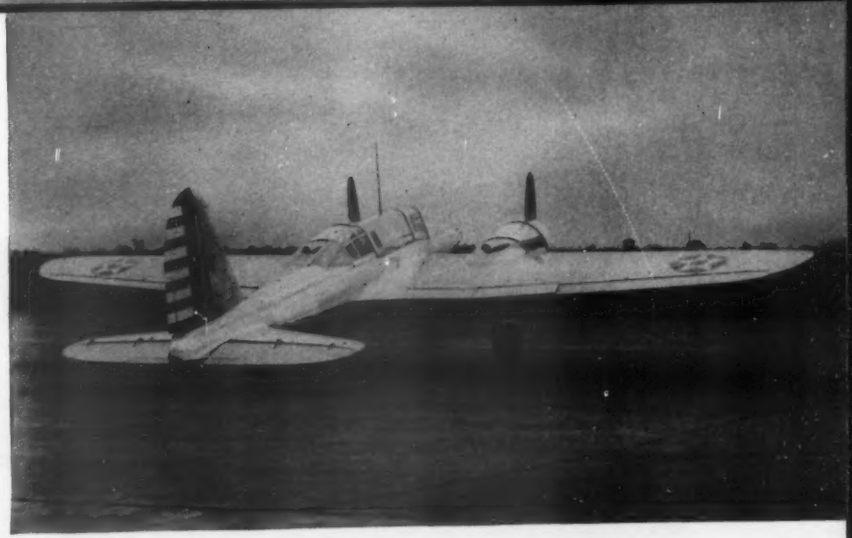
Power curve for Aeronca 45 Series

The E-113-CD engine delivers 42 hp. at 2,500 r.p.m. and is identical with the 113-C except for dual ignition. The E-113-CB rated at 42 hp. at 2,500 r.p.m. carries a slight change in cam action and a heavier train of timing gears. The E-113-CBD has an approved rating of 45 hp. at 2,500 r.p.m. and weighs only 125 lb. complete. This engine incorporates the new cam system, dual ignition, and an automatic overhead oiling system, a feature which is available as special equipment on all Aeronca engines of the current series, and also the older 113-A and B series now in service. Through flowing the warm engine oil through the valve push rod enclosure tubes, the dural pushrods are kept warm, thereby compensating for increased valve clearances caused by increased cylinder temperatures.

Specifications of the Aeronca 45:

Weight complete: 125 lb. including two magnetos, carburetor, hub and overhead oiling system.
Rated hp.: 45 at 2,500 r.p.m.
Bore: 4¼ in.
Stroke: 4 in.
Displacement: 113.5 cu.in.
Compression ratio: 5.4 to 1.
Speed of magneto, camshaft, Tachometer and oil pump: one-half crankshaft speed.
Spark plugs: BG-4B1.
Oil capacity: three quarts.
Oil pressure: 55 to 60 lb. at 120 deg. F.
Oil consumption: ½ pt. per hr., cruising.
Fuel: 73 octane aviation gasoline.
Fuel consumption: 3 gals. per hr., cruising. 3½ gals. per hr., full throttle.

Curtiss A-18 Fastest ATTACK PLANES of the U.S. ARMY



The Curtiss A-18 all-metal, twin-engined monoplane, with retractable landing gear, is the fastest Attack airplane of the United States Army Air Corps.

Equipped with Curtiss Constant Speed "Feathering" propellers and powered by 1000 H.P. Wright Cyclone engines, the A-18 is designed primarily for use in low altitude attack or light bombardment.

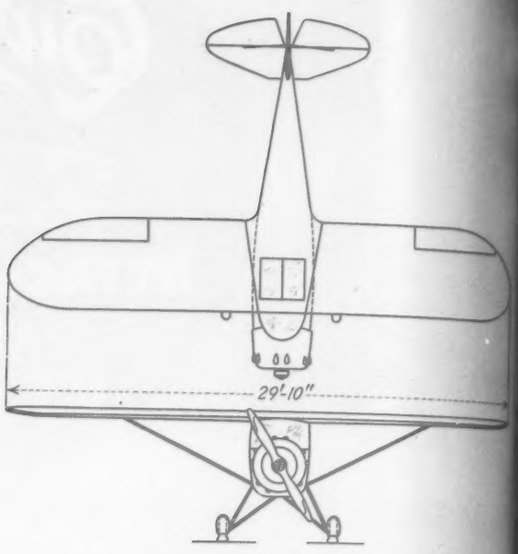
A production order of Curtiss A-18 Attack airplanes was recently delivered to the U. S. Army Air Corps.

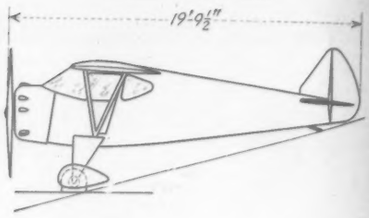
CURTISS AEROPLANE DIVISION
CURTISS-WRIGHT CORPORATION
Buffalo New York

"The Pioneers of Aviation"

Curtiss PRECISION-BUILT ARMY AND NAVY AIRCRAFT

WENDT Monoplane





New cabin monoplane makes debut at Chicago Show

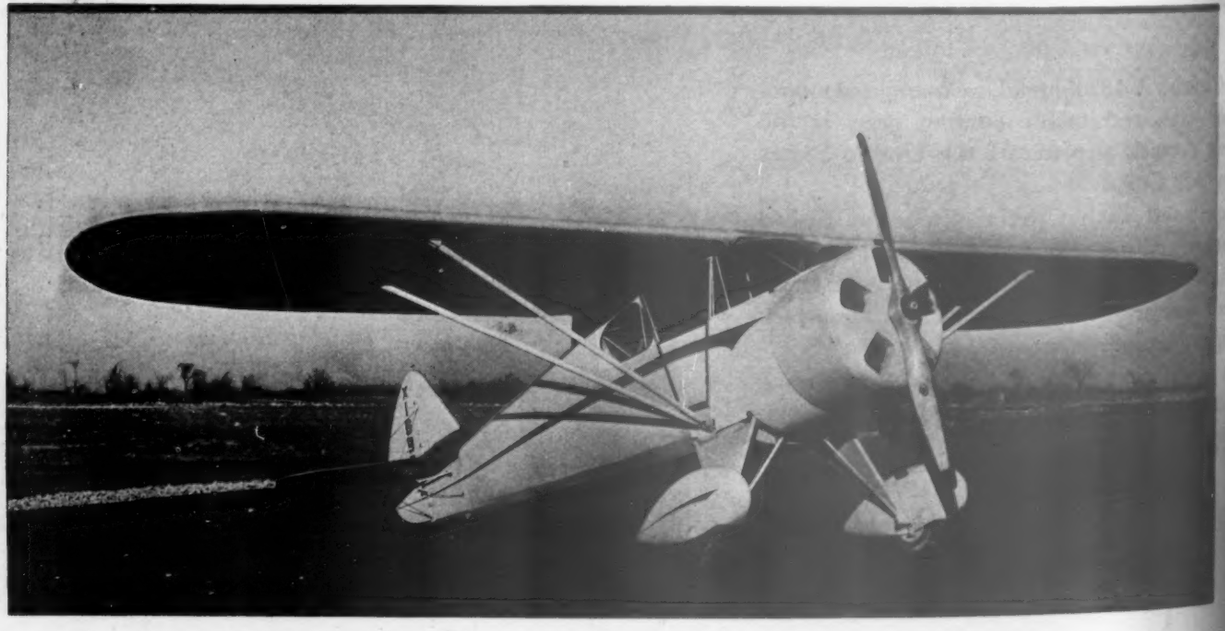
Flying Equipment

FIRST SHOWN at the recent Chicago Show, the Wendt two-place monoplane is a newcomer to the medium price field. Of mixed construction and conventional design throughout, the Wendt is a braced high wing cabin monoplane providing side by side seating. A fixed landing gear is provided with wheel pants and shock absorbers. Powered with the Warner Scarab Jr. the Wendt is rated by the manufacturer at 142 mph. top speed at 2,050 r.p.m. and 130 mph. cruising speed at 1,850 r.p.m. With a span of 29 ft. 10 in. and wing area of 120 sq.ft., the Wendt has a gross weight of 1,400 lb., empty weight of 740 lb., wing loading of 10 lb. per sq.ft. and power loading of 15½ lb. per hp.

Controls are of the dual wheel type supported from an overhead column control system. Dual adjustable rudder pedals are fitted. Wings and fuselage are covered with Flightex fabric finished with Sherwin-Williams enamels. Upholstery is by Laidlaw, and the cabin is sound shielded and ventilated. Stewart Warner heater is optional equipment. Doors are hinged at the top and swing up from the bottom providing full vision in flight for instruction or sight seeing.

Specifications as supplied by the manufacturer are:

Span: 29 ft. 10 in.
Height overall: 97½ in.
Length overall: 19 ft. 9½ in.
Chord: 60 in.
Wing area: 120 sq.ft.
Airfoil: Clark Y.
Weight empty: 740 lb.
Gross weight: 1,400 lb.
Wing loading: 10 lb. per sq.ft.
Power loading: 15½ lb. per hp.
Power plant: Warner Scarab, Jr.—90 hp. at 2,050 r.p.m.
Fuel capacity: 25 gal.
Fuel consumption cruising: 6 gal. per hr.
Propeller diameter: 7 ft.
Top speed: 142 mph. at 2,050 r.p.m.
Cruising speed: 130 mph. at 1,850 r.p.m.
Landing speed: 42 mph.
Rate of climb—initial: 1,100 ft. per min.
Service ceiling: 18,000 ft.
Cruising range: 580 miles in four hours.



SIR HUBERT WILKINS
...UTS "GUBA" THROUGH HER PACES

TAKEN FROM ENGINEERS SEAT OVER ARTIC OCEA

SIR HUBERT WILKINS
Meets Old Friend at Aklavik

Major R. H. Fleet, President
Consolidated Aircraft Corporation
San Diego, California

Dear Major Fleet:-

I am writing you these few lines in appreciation of the excellent service rendered me and my party by Mr. Richard Archbold's flying boat, the "Guba", built by you and used by me in the recent search for the missing Russian transpolar expedition.

During our search, we covered over 19,000 miles of intensive flying, under the most adverse weather conditions, flying over rough and uncharted terrain, and, for the most part, heavily loaded with fuel, supplies, and equipment. At times, the boat was loaded to a gross weight approximating 31,000 pounds but nevertheless took off with utmost ease, frequently from bodies of fresh water where takeoff is more difficult than from salt water.

Although the propellors were equipped with deicers, the wings and tail surfaces were not, and frequently we flew through sleet-like storms causing considerable accumulation of ice on the surfaces. We did not encounter any difficulty in flying or control, in spite of the above condition nor did we have any trouble with ice formation on the ailerons or between ailerons and wings.

In addition, every component of the entire airplane functioned exceptionally well at all times. No part of the airplane showed any signs of failure or fatigue.

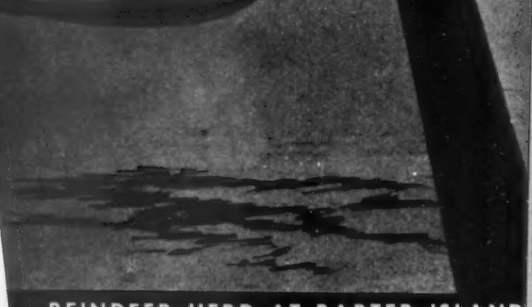
It is my privilege to congratulate you and your associates, and all those who had a part in the fabrication of this magnificent airplane, in no uncertain terms. Without it, we could not have even attempted our difficult task.

Kindest regards,

Sincerely yours,

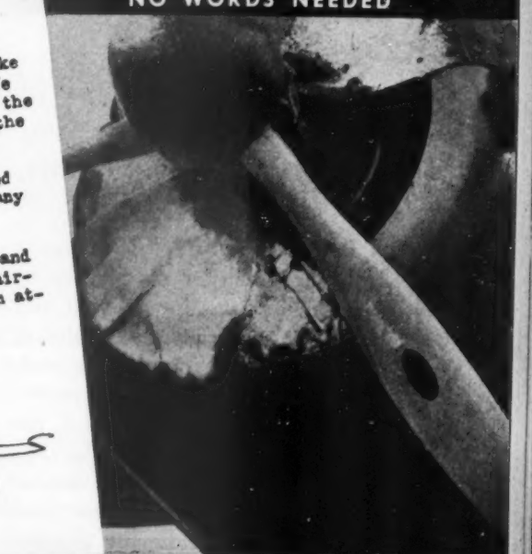
Hubert Wilkins

Sir Hubert Wilkins



REINDEER HERD AT BARTER ISLAND

NO WORDS NEEDED



...SNOW AND ICE

MAP OF GUBA'S COURSE..

GASSING AT AKLAVIK
IN THE ARTIC CIRCLE

ON (Pilot) CHESSMAN (Co-Pilot)

CONSOLIDATED
AIRCRAFT CORPORATION
Established 1923

$200 a Week!

How would you like to take in $200 a week . . . to be in business for yourself . . . to write your own pay checks? The Bennett plan has done this for others and can do it for you.

BENNETT Air Service offers you the chance you have been itching for—to learn to fly, own your own plane, go in business for yourself and become a part of the aviation industry. A number of young men now operating their own businesses under the BENNETT Plan are taking in $200 and more a week on instruction, sales, passenger hopping and the like.

There is a growing demand all over the country for small airports to handle the phenomenal increase in light plane flying—where low-cost flying instruction, and airplane sales, can be made convenient. Take your own town, for instance. You know a lot of fellows, don't you, who will learn to fly as soon as low cost, convenient instruction is made possible? Jot down their names and see how long a list you get. Then multiply that number by the thousands of communities which have no flying fields—and you can see for yourself what unlimited opportunities await you.

The BENNETT graduate is ahead of the crowd. He's a five star career man: (*) a skilled transport pilot . . . (**) a competent flying instructor . . . (***) a dependable airplane and engine mechanic . . . (****) an efficient airport operator . . . (*****) a trained airplane dealer. *He's in business for himself — writing his own pay checks!* Remember, as a BENNETT graduate unemployment can hold no fears for you. No one can fire you, because you will be your own boss.

SPECIAL OFFER

TRANSPORT COURSE AND A NEW AIRPLANE FOR $1688

Our one-cost combination offer includes: 1. This brand-new 1938 Cub airplane. 2. A transport pilot's course. 3. A practical aviation business course, covering airport management, airplane sales, passenger business, school operation, everything you need to know to be successful in your own aviation business.

The whole Plan, complete—airplane and all—is yours for only $1688. It can be financed for as little as $500 cash and the balance monthly. Or two partners can work the same plan for only $994 each, $330 cash and the balance monthly.

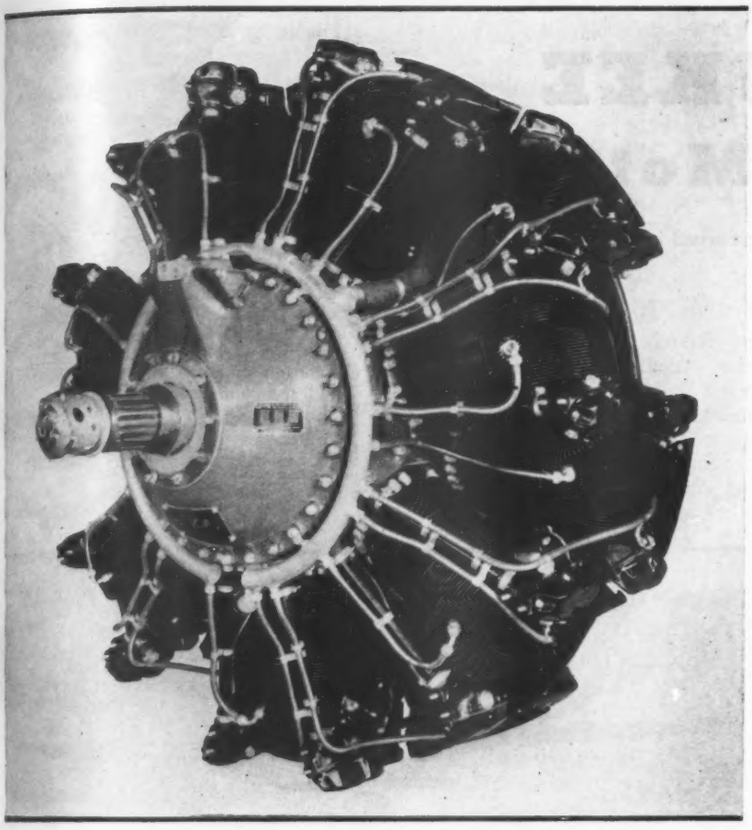
IMPORTANT

When choosing an Aviation School ask yourself this question: "WHAT SHALL I DO WHEN I FINISH MY COURSE?" Here, you know the answer BEFORE you start. Our plan takes the "MAYBE" out of your future. Let us show you how YOU, too, can start earning money as soon as you complete your training. Send for Complete Details, telling how young men are making money following our Plan.

Write for complete details TODAY!

Bennett Air Service

Box 247-A, Hightstown, New Jersey



Flying Equipment

Double Row CYCLONE

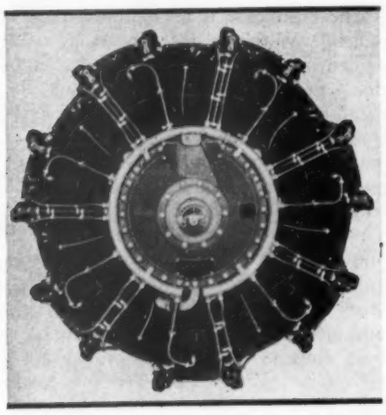
Wright Aeronautical's newest 14 cylinder engines will power Boeing Clippers

FIRST COMMERCIAL INSTALLATION of the double-row Cyclone 14 by Wright is to be made in the Boeing 314 transoceanic flying boats, the first of which is now nearing completion at Seattle. Four of the Cyclone 14's will be used in the new Clipper which has a wing span of 150 ft. and carries 72 passengers.

The new engine has passed the tests of both the Bureau of Air Commerce and the Air Corps at a take-off rating of 1500 hp. and a rating of 1200 hp. for normal sea-level operation. Total displacement of the fourteen cylinders is 2600 cu.in. Announcement of the new power plant was made recently by officials of the Wright Aeronautical Corporation, engine division of the Curtiss-Wright Corporation.

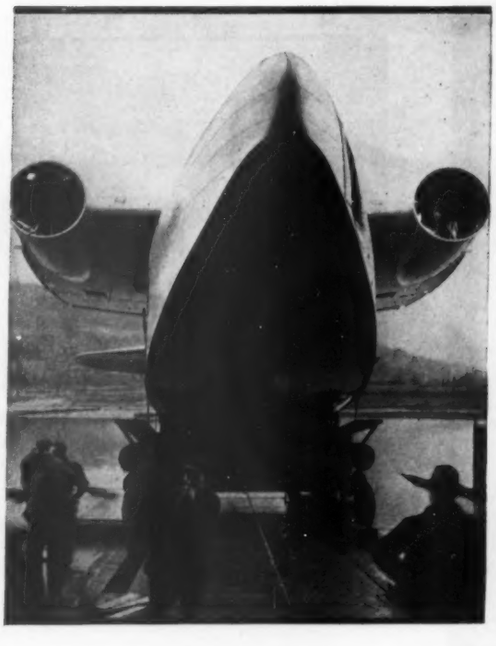
It is interesting to note that the four Double-row Cyclones of the Boeing Clippers produce as much power (6000 hp.) as 10 of the twelve Curtiss Conquerer engines which powered the famous German Dornier DO-X on its trans-Atlantic flights of 1929 to 1931. The DO-X, the first large scale flying boat, was equipped with liquid cooled engines, rated at 600 horsepower each. Each of the double-row Cyclones of the new Pan American Boeing Boats produces more than twice the power for take-off of the Curtiss Conquerer, although the cubic inch displacement and total weight are not proportionately greater.

The first military application of the Wright Double Row Cyclone 14 will be made by the U. S. Navy which has selected this type of engine to power the new Martin twin engined Patrol boats for which a contract was recently placed with the Glenn L. Martin Company of Baltimore, Maryland.



Above: Front view of the Double Row Cyclone.

Below: Hull and center section of the Boeing Clipper showing position of two of the four Double Row Cyclones.



MILWAUKEE "Sky Motor"

70 hp. light plane engine is inverted in-line type

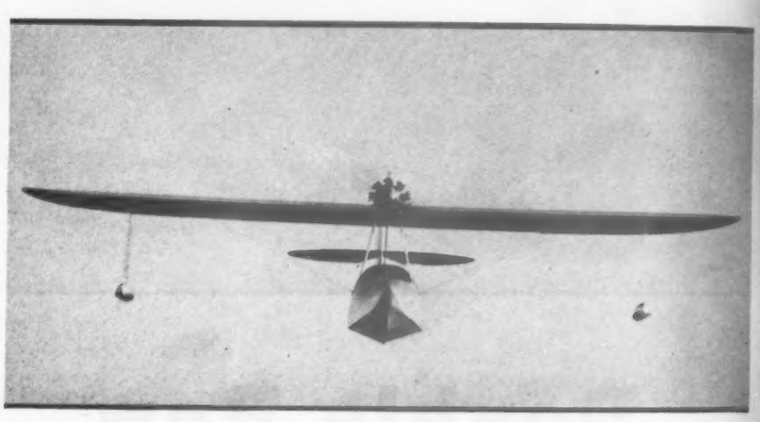
DEVELOPED by the Milwaukee Parts Corporation, the Sky Motor is arranged in the familiar in-line inverted fashion, the top of the engine is only five inches above the crankshaft center-line. An integral oil sump along the bottom of the engine is finned for cooling and has a capacity of two gallons. Directly above the sump is the underhead camshaft housing with a five bearing camshaft. Cam followers bear directly on valve stem.

The crankcase is an aluminum alloy casting. With five main bearings, and drilled for lightness and oil distribution, the crankshaft is dynamically balanced and is said to give a very smooth running engine.

Cylinders and head are cast in one piece, bolted to the crankcase with studs and nuts. Each cylinder carries a nickel steel liner. Heads have aluminum bronze valve seats and valve guides. Connecting rods are of forged steel with spun babbitt bearings. Aluminum alloy pistons are machined for four rings, two compression and two oil rings. Piston pins are full floating. The oil filler cap and breather are incorporated in one unit at the rear of the engine. Provision has been made for starter and generator. Standard equipment includes two Scintilla magnetos, eight Bosch spark plugs, Stromberg double venturi carburetor, standard tachometer drive, propeller hub and air intake scoop. Endurance and calibration tests were completed early in February and ATC is pending. Rating requested is 60 hp. at 2000 r.p.m., though 66 hp. is available at 2200 r.p.m. according to tests.

General specifications are:

Sky Motor: Model 70 Direct drive.
Type: air cooled, inverted, inline.
Number of cylinders: four.
Bore: 3⅜ in.
Stroke: 4¼ in.
Displacement: 200 cu.in.
Compression ratio: 6.25 to 1.
Rating: 60 hp. at 2,000 r.p.m.—sea level.
Rating (Maximum): 70 hp. at 2,350 r.p.m. at sea level.
Fuel: 73 octane.
Fuel consumption: .56 lb. per hp. hr. or 4 gals. per hr. (cruise).
Oil consumption: .011 lb. per hp. hr. or ½ pint per hour (criuse).
Width: 19½ in. across magnetos; 10 in. center to center engine bearers.
Length overall: 40 7/8 in.
Dry weight: 198 lb.
Shipping weight: 300 lb.



TRIMMER Seaplane

Monoplane flying boat powered by Salmson engine

A NEW LIGHT SEAPLANE has been developed by Gil Trimmer, pioneer Nassau lightplane builder, and is now being tested at Palm Beach, Florida. A wire braced high wing monoplane flying boat, the Trimmer is of mixed construction, with spruce and plywood hull, spruce spars and stainless steel ribs in the wing, which is fabric covered, and fabric covered steel tube tail group. Center section and engine mount are of chrome molybdenum tubing. Specifications show a span of 34½ ft., a length of 21 ft., weight empty of 640 lb., and gross weight of 1140 lb. Powerplant is a 50 hp. Salmson radial with which a top speed of 85 mph has been estimated. Calculated are a cruising speed of 75 m.p.h., range of 180 miles, and rate of climb of 600 ft. per minute.

BATWING MONOPLANE. Designed by Walter F. McGinty of the Boeing School of Aeronautics faculty, the Batwing tailless monoplane has a pusher engine installation and a tricycle landing gear. Power plant is the 75 hp. Pobjoy Model R. The airplane was built by the Batwing Aircraft Corporation of Alameda, Calif., and is soon to be on the market in the moderate price class. The principle of design will be applied to larger models of the single and twin engine type.

Aircraft Manufacturers:

Aircraft Manufacturers:

COMPARE MENASCO 250

with any other engine

MENASCO Model C6S-4

DISPLACEMENT	544 cu. in.
COMPRESSION RATIO	5.5 to 1
DRY WEIGHT, complete	535 lbs.
HORSE POWER for take-off	285
R P M for take-off	2400
HORSE POWER, continuous	260
R P M, continuous	2300
HORSE POWER, cruising	200
R P M, cruising	2000
HORSE POWER at 7500 ft.	260
WEIGHT PER H.P.	2.05 lbs.
HORSE POWER PER CU. IN. DISPLACEMENT	.477

SUPERCHARGER— Inbuilt, centrifugal

FUEL CONSUMPTION— .54 lb. per H.P. Hour @ 260 H.P. Output

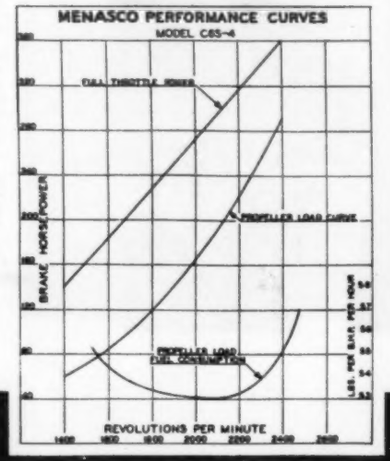
FRONTAL AREA 2.9 sq. ft.

VALVE MECHANISM— Automatically lubricated and fully enclosed

OIL FILTER PRESSURE-TYPE COOLING BAFFLES

Provision for All Accessories

Available for all Propellers



ANY OTHER ENGINE

DISPLACEMENT	____ cu. in.
COMPRESSION RATIO	___ to 1
DRY WEIGHT, complete	____ lbs.
HORSE POWER for take-off	_____
R P M for take-off	_____
HORSE POWER, continuous	_____
R P M, continuous	_____
HORSE POWER, cruising	_____
R P M, cruising	_____
HORSE POWER at 7500 ft.	_____
WEIGHT PER H.P.	____ lbs.
HORSE POWER PER CU. IN. DISPLACEMENT	_____

SUPERCHARGER _____?

FUEL CONSUMPTION, _____ lb. per H. P. Hour @ _____ Output

FRONTAL AREA _____ sq. ft.

VALVE MECHANISM--Automatically lubricated _____?
Fully enclosed _____?

OIL FILTER _____? PRESSURE-TYPE COOLING BAFFLES _____?

Provision for All Accessories _____?

Available for all Propellers _____?

MENASCO MANUFACTURING CO.
6917 MC KINLEY AVENUE. LOS ANGELES, CALIFORNIA

MENASCO ENGINES ARE BUILT IN 7 MODELS
—50 h.p., 95 h.p., 125 h.p., 150 h.p., 160 h.p., 200 h.p., 250 h.p.

Delta air lines 100% equipped with AIRWHEELS*

DELTA AIR CORPORATION
CONTRACT OPERATORS A. M. 84
SELMAN FIELD, MONROE, LOUISIANA
Goodyear tires and wheels are standard equipment on all our Lockheed Electra transports, which is the best testimonial we can give them.
C. E. Woolman
General Manager

IT'S safety first on the Delta air lines whose fleet of swift Lockheed Electras covers the south from Charleston to Dallas. That is why Goodyear Airwheels, Tubes and Goodyear Hydraulic Disc Brakes are used on all ships.

Airwheels are *safer* because they have a wider cross section and operate at lower pressure than any other type of tire. Their larger area of ground contact and greater cushion support heavy transports on soft, muddy or soggy fields where ordinary tires bog down, insuring safe landings and take-offs under the most unfavorable conditions.

Goodyear Disc Brakes are *safer* because their powerful super-smooth hydraulic control acts like an iron hand in a velvet glove in bringing ships to a quick gentle stop after a short run. They are sure-acting and require minimum attention.

On many other famous American and foreign air lines and military ships Goodyear landing equipment is standard because of its proved superior safety and dependability. Goodyear engineers will be glad to consult with you in specifying the correct size and type of tires and brakes for any ship—just write Goodyear, Aeronautics Department, Akron, Ohio, or Los Angeles, California.

***IF IT ISN'T A GOODYEAR IT ISN'T AN AIRWHEEL**

AIRWHEEL is Goodyear's trade-mark, registered in the U. S. A. and throughout the world, and is used to denote that Goodyear is the exclusive maker of AIRWHEEL Tires.

THE GREATEST NAME IN RUBBER

GOODYEAR

ON YOUR NEW SHIP SPECIFY GOODYEAR AIRPLANE TIRES AND BRAKES

THE AVIATION NEWS

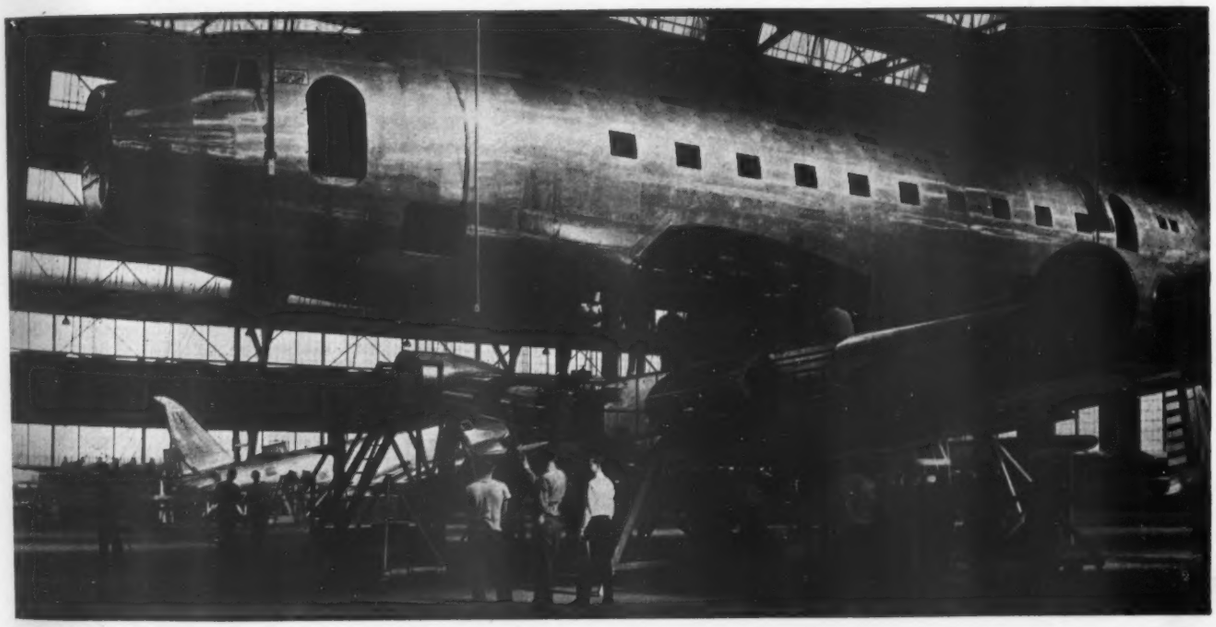
REVIEW, COMMENT, FORECAST

DANIEL SAYRE
C. F. McReynolds, *Pacific Coast*
Blaine Stubblefield, *Washington*
E. R. Lockin, *New York*

APRIL 1938

Rickenbacker Group Cops EAL Control

(Story on page 52)



WHAT A DOUGLAS: The really astounding proportions of the DC-4 become apparent as the fuselage is moved out of its scaffolding. Here workmen are fitting the center section, first step toward final assembly. Test flight dates are still "just around the corner" but unless unexpected delays occur DC-4 No. 1 should be well along on her shakedown program by mid-May.

SQUALL LINE: One of these Hawker Hurricanes showed what a modern military machine could do with a little tail wind when it was flown one night recently from Edinburgh to a field near London at an average speed of 409 m.p.h. It was all very reassuring. But realistic M.P.s went to the mat last week with Britain's Air Minister, Viscount Swinton, charging inefficiency in the Empire's air rearmament, claiming that not a single important munitions center of Germany could be reached by present British bombers. *Wide World Photos*

North American To Sell Eastern Air

Rickenbacker backers gain control after TWA bid falls short

WHO IS GOING TO GET EASTERN AIR LINES? Ever since the Air Mail Act of 1934 specifically left a loophole through which a transcontinental system could acquire Eastern assets, rumors have come flocking like Cubs to an air meet. Last month the pay-off. We reprint the following excellent summary from our contemporary, *Business Week:*

"Capt. E. V. (Eddie) Rickenbacker, America's No. 1 wartime pilot, is still in control of the strategic Eastern Air Lines, despite efforts of Transcontinental & Western Air (Lindbergh Line) interests to take it over.

Rickenbacker, backed by the banking firms of Smith, Barney & Co., and Kuhn, Loeb & Co., outbid John Hertz, of Lehman Bros., to acquire Eastern Air from North American Aviation, Inc. Rickenbacker, as a director of North American and as operating head of Eastern Air, had the "inside" track. But in the end, it was money that talked. The successful bid called for $3,500,000 in cash. The TWA consortium offered $1,000,000 in cash and $2,250,000 in notes.

"Rickenbacker will head Eastern Air, after it is divorced from North American. It will be independent. In addition to seaboard routes, it runs planes from Chicago to Miami and from Atlanta to New Orleans and Houston. Its connections with Pan American Airways, which Eastern serves as a feeder, have proved advantageous. Indeed, Eastern is one of the few air transport lines to operate at a profit. Report for 1937, just out, reveals net income of $197,000 on an employed capital of $2,600,000.

"After a series of legal steps, the Smith, Barney-Kuhn, Loeb banking group will place stock of a newly formed Eastern Air Lines corporation on the market by semi-private or public offering.

"But first, North American Aviation shareholders must approve the sale. A meeting has been called for the end of this month to put the proposition to a vote. Inasmuch as General Motors Corp. owns approximately 30% of North American stock, and inasmuch as G. M. officials were consulted, it is expected that the necessary votes will be mustered.

"North American will then set up Eastern Air Lines as a separate corporation, will register the stock of the new corporation with the Securities & Exchange Commission, and then Smith, Barney and Kuhn, Loeb will go through the formal motions of buying this stock. The securities markets being willing, the stock will be distributed along about April.

"Sale of the Eastern Air properties by North American accomplishes two purposes: (1) provides North American, which specializes in the manufacture of war planes, with additional capital for expansion—in preparation for a heavy rearmament demand from the United States Government; (2) frees Eastern Air from a doubtful status under the laws covering air mail contracts.

Planes Are Heroes of L. A. Flood

TWA ship loss is only casualty in wildly busy week

ONE OF THE HEAVIEST RAINSTORMS in the history of Los Angeles, and the most destructive of life and property, took toll of the airlines when a TWA plane disappeared over central California Tuesday night, March 1, while en route to Los Angeles from San Francisco. As we go to press three weeks later, no trace has been found despite an intensive search headed by Jack Frye and Paul Richter, TWA president and vice-president, respectively. The plane was in charge of Capt. John D. Graves and there were nine persons aboard at the time. It is believed to have crashed in the Sierra Nevada mountains east of Fresno, deeply mantled in snow. Continued storms have hampered ground and air search parties.

Though the storm blanketed all of California for several days, and completely stopped airline operations on Wednesday, March 2, it brought rich compensation to the lines thereafter. Heavy floods of Wednesday and Thursday, March 2nd and 3rd, completely isolated Los Angeles from the outside

SEVERSKY PROPOSES: This "flying hotel" (every room with bath) has been projected by Major Alex de Seversky's company to meet Pan American's specifications for a trans-Atlantic transport (see AVIATION, January, 1938). Interesting features are the disposition of the eight 2,000 hp. liquid-cooled engines, and the proposed use of shot-welded stainless steel for the major part of the structure. Most novel suggestion centers about the twin floats which are intended to retract upward against the bottoms of the fuselages once the machine has cleared the water.

Wide World

FOR AIRMEN ONLY: One of the British Navy's new multiple machine guns for anti-aircraft defense. Talk of things like this echoed through Washington last month as Congress debated the Vinson Big Navy Bill. Could planes really sink battleships or vice versa? At one stage threats of an "air-minded bloc" seemed likely to become more of an obstacle to the increase of our battle-wagon forces than all the pacifists, economists and anti-British-understanding-lists. What now seems likely is that the Navy will get its new ships; the air strength advocates will be granted substantial increases in airplanes.

world, washing out numerous bridges, stopping all rail and bus traffic out of Southern California, and even drowning out all of the telegraph lines serving Los Angeles. Only contacts with the outside world left to Los Angeles on Thursday were the radio and airlines. Every available piece of flying equipment was quickly pressed into service. Passengers stood in line all day Thursday, Friday and Saturday waiting their turns aboard planes headed East, North, or South, and traffic continued at a record pace until Monday, when rail and bus service was resumed.

In the meantime record loads of mail and express were being piled into the airliners while all manner of special flood aids were being rendered on the side. United Airlines flew double sections, and some triple sections, on all schedules both north and south for three days, bringing five extra planes into the Los Angeles division for temporary service. On one load a United airliner brought in 3500 lbs. of yeast to help avert a bread shortage, and 100 pairs of rubber boots for relief workers. For several days all Los Angeles newspapers normally sent to distant cities went out by air express. And Western Air Express, which normally carries about 600 lbs. of air mail per schedule, sent one DC-3 out completely loaded with mail and express, with not a passenger aboard—over three tons of mail and express in one package! On Thursday United Airlines carried 7657 lbs. of express and 4553 lbs. of mail in and out of Los Angeles, a new record for a 24-hour period for one airline. An interesting side-light was the cargo of telegraph messages carried in and out

(Turn to Page 61)

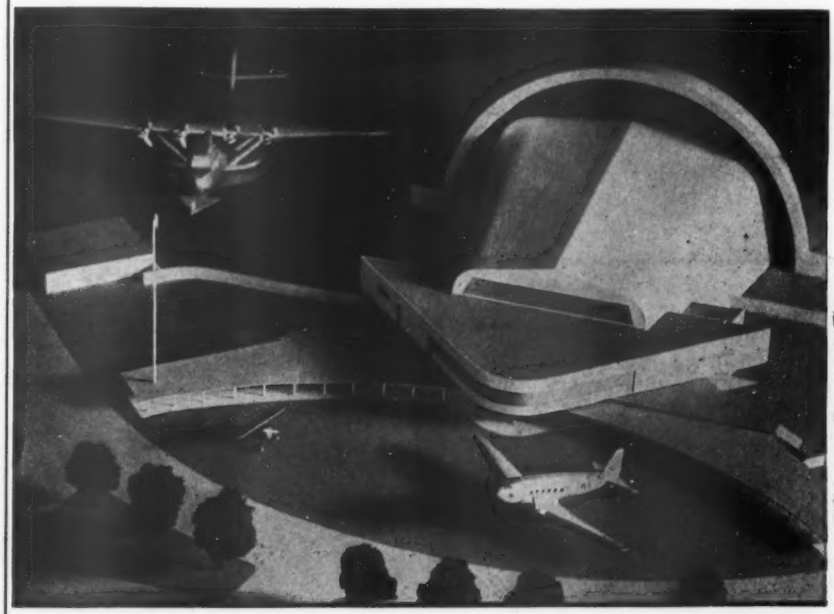
Douglas Makes a Million

CONSOLIDATED net profit of Douglas Aircraft Company, Inc., for the fiscal year ended November 30, 1937, totaled $1,081,513.04, equal to $1.90 a share on the 570,680 shares outstanding, according to a report by Donald Douglas, president. This compares with a profit of $976,342.33 for the 1936 fiscal year. Net sales last year totaled $20,950,-316.39 compared with $7,867,790.41 in the preceding year. Backlog of unfilled orders on Feb. 17th, 1938, stood at $28,300,000, compared with $24,322,000 the previous year. Approximately one million dollars was expended for new equipment and plant construction during 1937. Current assets as of November 30, 1937, totaled $14,798,815.42, compared with current liabilities of $8,412,926.65.

Operators Would Organize

A STEADY FLOW OF LETTERS from fixed base operators endorsing the idea of forming a national association is coming in to the organizing committee, according to Hugh C. Robbins of Cleveland, who is handling the preliminary survey east of the Mississippi. The western division is being surveyed by Hall Henning of Dallas.

The organizing committee was formed at a meeting during the Chicago Show with Rel K. Branch of the U. S. Junior Chamber of Commerce acting as chairman. Minutes of the several sessions will be prepared and distributed by AVIATION magazine.



FOR THE FAIR: The symbolism of the exterior design of this building, which will house the aeronautical exhibits of the New York World's Fair, 1939, doesn't quite get through to us. But architect's drawing of floor plan and interior arrangement indicate many possibilities for strikingly effective display of aircraft and accessories. With the opening of the fair but one year away, plans for construction of the building are well along and aeronautical people are already designing displays. Tom Morgan, chairman of the board of the Sperry Corporation, heads up the aeronautical advisory committee.

L. A. Show Should Pack 'Em In

First Military Display Tops Long Attraction List

A "SELL-OUT" sixty days ahead of opening time, the Third National Pacific Aircraft and Boat Show looks like a good bet to set a new high in public interest and attendance when the doors are thrown wide on April 2 for a run through April 10. This year, merchandising efforts of previous shows are to be topped by more elaborate decorations, more extensive exhibits, and by educational displays designed to attract air-minded people to the show arena. It is reported that the show management has spent $25,000 on a scheme of interior decoration which features a completely draped ceiling of chartreuse satin, and side walls draped in silver metal cloth. The Show program will feature outstanding musical programs, special appearances by stars of stage and screen recruited from nearby Hollywood, and special Show-days dedicated to the major aviation industry units located in the Southern California area.

Among features planned for the show floor is to be the first military aircraft exhibit to be staged on the Pacific Coast. It will include, according to information available at time of going to press, a Douglas B-18 bomber, a Vultee attack-bomber, a Northrop attack, and a North American pursuit-trainer. Another feature will be the sportplane salon, a grouping of light sport aircraft along a single aisle of the show building. A third will be a life-size mock-up of a Douglas sleeper plane, which will constitute a "working" model in cut-away form. Passengers will be shown being served meals by a stewardess. Professional models are to demonstrate the luxurious berths.

A record number of new planes and engines is also reported scheduled for showing at Los Angeles, including several of the new 50 h.p. engines recently announced, and probably models recently placed on the market by Aeronca, Bellanca, Cessna, Dale, Gwynn, Luscomb, Ong, Stinson, and others.

Rearwin Gets Menasco-50's

MENASCO MANUFACTURING COMPANY has received an order covering nine engines for Rearwin Aircraft, Kansas City. Two of the new Menasco powered Rearwin Speedsters are to be shipped to the South African Flying Service, Johannesburg. Others are on order for sportsman pilots within the United States, largely as a result of sales made at the recent Chicago Air Show. Production on the Menasco M-50 is now in full swing and regular shipments are being made to the Aeronautical Corporation of America, Lunken Airport, Cincinnati, which is installing the 50 h.p. Menasco engine in the new 1938 model Aeronca.

Bendix Sets Up Coast Unit

BENDIX INSTRUMENT COMPANY has been incorporated in California by Bendix Aviation Corporation, Ltd., for the purpose of handling sales and service on the Pacific Coast of Pioneer Aircraft Instruments and other products manufactured by Bendix Aviation Corporation. The new company takes over the activities in the aircraft field of Pacific Scientific Company. W. P. Balderston, for many years head of the latter firm, will act as President of the new Bendix Instrument Company. Offices and shops have been established in the Bendix Building, Los Angeles. In addition to handling sales and service on the present line of Pioneer and Bendix products, the new firm will develop and market a number of new instruments and accessories. Among these is a new compact cable tension measuring instrument, and a propeller pitch indicator for quickly determining propeller blade pitch in the field, without dismounting the propeller. Officers of the new Bendix Instrument Company are: W. P. Balderston, president; Decker G. McAllister, first vice-pres.; Palmer Nichols, second vice-pres.; W. L. Robinson, secty.; W. J. Buettner, treasurer. Directors are: Palmer Nichols (Chairman of the board), W. P. Balderston, D. G. McAllister, Charles Marcus, and W. L. Robinson.

WAE Shapes Its Plans

ALVIN P. ADAMS, president of Western Air Express, in his current report to stockholders, states that the outlook for the current year is favorable, though the company lost $34,139.58 in 1937 as compared with a profit of $50,697.44 in 1936. Passenger revenues in January, 1938, were 89 per cent ahead of 1937, and the company has received authority for additional air mail schedules, according to Adams. The report further foresaw operating advantages to be derived soon from interchange of equipment with United Air Lines to provide through sleeper service between Los Angeles, Chicago, and New York. Total revenues for 1937 increased to $886,713 compared to $740,984 in 1936. Due to installation of new and larger equipment operating costs in 1937 were $864,579 as against $556,677 for 1936. Mr. Adams stated that a considerable portion of this cost was of a non-recurring nature and looked for a marked reduction in 1938. Plans are reported under way for offering additional stock to improve the company's working capital position. Stockholders of Western Air Express at their annual meeting, March 8, ratified the proposal to sell 130,818 shares of stock to shareholders on the basis of one new share for each two shares held, at $2 a share, and authorized the Boettcher-Newton interests of Denver to underwrite all warrants not subscribed to under the plan. A new stock purchase plan for employees involving 6666 shares was approved, together with a similar special management stock purchase plan. Upon approval of the Securities and Exchange Commission of the issuance of the new stock it is expected that Charles Boettcher II of Denver will become chairman of the board of Western Air Express. Charles N. James, vice-president, presided at the annual meeting in the absence of Alvin P. Adams, president. All retiring directors were re-elected, including Charles Boettcher II, W. F. Nicholson, and S. F. Balif, Jr., who were elected to the board since the first of this year. In a report on current operations James stated that passenger revenues for January, 1938,

FAIRCHILD PRODUCTION: A group of model-24's moves through the Hagerstown (Md.) factory. Fairchild executives were set up last month by an order from the Bureau of Air Commerce for twenty-three planes.

were 89 per cent ahead of January, 1937, that air mail poundage for February increased ten per cent to approximately 60,000 pounds, compared with 1937, and that passenger miles flown for February showed an increase of 42 per cent over the previous year. Plans were also announced for the opening of scenic flights over Boulder Dam, Yellowstone National Park and possible entry into Glacier National Park, during the 1938 tourist season.

PROFITS AND LOSSES

» AERO SUPPLY MANUFACTURING CO., for year ending Dec. 31, 1937, net profit after $7,537 surtax, $236,058; compared with net profit of $58,508 for 1936.

» BELLANCA AIRCRAFT, for year ending Dec. 31, 1937, net income $120,264; for 1936, net loss $62,035.

» BREEZE CORPORATIONS, INC., for year ending Dec. 31, 1937, net income $93,501, which does not include profits and losses of its subsidiaries, Federal Laboratories, Inc., and Essex Tool & Die Company, Inc., acquired during 1937.

» FAIRCHILD AVIATION CORPORATION, for year ending Dec. 31, 1937, net profit $137,728 or 41 cents a share, compared with $78,982 or 23 cents a share for 1936.

» GRUMMAN AIRCRAFT ENGINEERING CORPORATION, for year ending Dec. 31, 1937, net income $139,062, or 32 cents a share on 431,865 capital shares.

» SOLAR AIRCRAFT COMPANY, for forty weeks to Feb. 5, net income $36,344 or 28 cents each on 129,640 shares. Net income for four weeks to Feb. 5, 1938, $7,128, with net sales of $49,135, the highest for any four-week period in the company's history.

» THOMPSON PRODUCTS COMPANY, for year ending Dec. 31, 1937, net income $905,813 or $2.92 a common share, as against net profit of $785,256 or $2.58 a share for 1936.

» TRANSCONTINENTAL & WESTERN AIR, for the year ending Dec. 31, 1937, net loss after deduction for new air mail routes and other charges, $959,837, compared with net profit of $205,126 or 32 cents a share for 1936.

» WACO AIRCRAFT COMPANY, for the nine months to Sept. 30, 1937, net loss, $30,214. For year ending Dec. 31, 1936, net loss $43,698. Company's fiscal year changed to end Sept. 30th. Net sales for first nine months of 1937 $877,244.

» WESTERN AIR EXPRESS CORPORATION and subsidiaries, for year ending Dec. 31, 1937, net loss $34,939, compared with net profit of $50,697 in 1936.

AVIATION IN WASHINGTON

by BLAINE STUBBLEFIELD

Air Mail Week may launch "All-First-Class" Drive

Air mail feeder system to be demonstrated during air mail week May 15 to May 21, contemplates only the promotion of the service, not sponsorship of legislation. But the demonstration starts a move toward a network of branch lines, eventually totalling more mileage than the present system. Overnight delivery of all first class mail is in sight. It's just a matter of time. Mail statisticians are surprised how little overnight delivery will affect the railroads. Much talk indicates supposition that the Post Office will pass out of the air picture when legislation is enacted. Far from it. The Post Office will designate the mail routes, get money from Congress, pay it out to carriers, as always. Little mail planes will boost private flying and manufacturing.

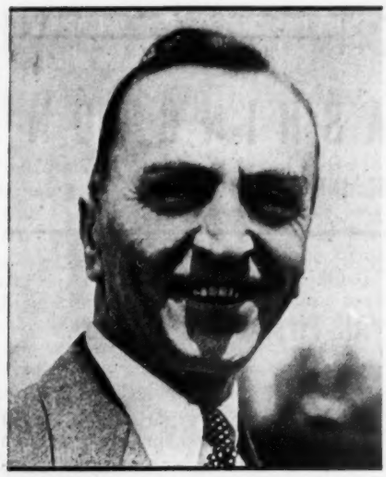
Subsidy for oversea flying is quiescent but the Maritime Commission stands firm as ever behind its recommendations pending in Congress. There are three possibilities. (1) No subsidy. PAA says it can operate without aid. It has always been subsidized, but might do without if government paid for ground properties and aids, as in this country. (2) Continued subsidy through mail, makes too high postal rate against foreign first-class rate for rair. (3) Direct subsidy for air, as for shipping under new maritime law. That is recommendation of the Commission, whose basic theory is that the U. S. cannot compete on an earning basis against foreign first class rate for air. (3) Direct Over-sea flying would not be subsidized under McCarran-Lea bills.

The Navy has shut down on Aeronautics personnel information, will stop equipment figures next year. Then the spies will know more than the press. . . . Civil Aeronautics Committee for the Senate is a dead issue at present. . . . Senator McCarran put private flying in his bill in a big way. . . . A lot of congressmen were waiting to sound off about TWA accident but California's flood took the headlines. . . . Glenn Martin testing the Barlow bomb for the Navy reminds that Army and Navy are always up to their ears in bomb and sight inventions. Most are NG because inventors forget important considerations. But technicians examine all, find a few good ones. . . . American Export, granted license for experimental flights to the Mediterranean, probably will do nothing before legislative knots are untangled.

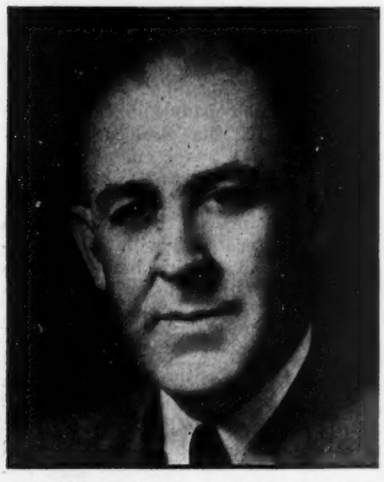
$3,000,000 for a Navy dirigible is more likely than not. President Roosevelt is reported to have said No. But here's the story. Mr. Roosevelt's friends say he's hepped up on mosquito (torpedo) boats. That's what the $15,000,000 experimental fund is for—or part of it. When somebody suggested a dirigible out of the $3,000,000, FDR thought it was a swipe out of his mosquito money. It looks as if House Naval Affairs can put a dirigible on the list without drawing on the experimental fund. And it probably will. When Germany comes over with her new ship this summer our balloonatics will go wild if we don't order one.

WPA airport aid though it now totals $77,000,000, of which 32 million was spent in 1937, is not answering the national "shortage." WPA port projects are primarily relief projects. The need for relief and the need for port improvement coincide in no more than one-third of cases. Fewer but bigger, more practical projects are coming to WPA, and sponsors are furnishing larger percentage of costs. Old projects are coming back for extensions. But WPA program does not substitute for federal aid program which cities are trying to write into the Lea and McCarran bills. Needed first is a comprehensive port program by the industry, Army, Navy, Post Office, private flyers, munieipalities, all planning cooperatively.

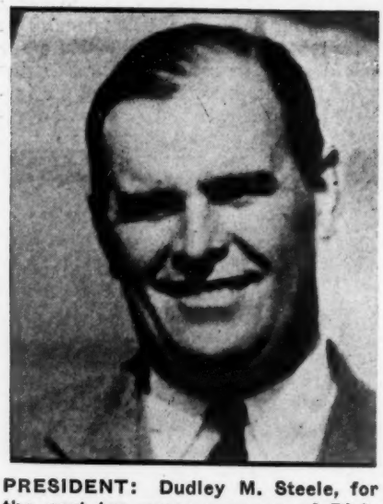
Canton and Enderbury, those suddenly famous islands, are small change in a lot of big Anglo-American sea-horse trading in the Pacific. Know-it-alls here say Pan American asked the government to flag the atolls. Some say it was a PAA exploring party, others say it was Navy airmen looking for Earhart, who spotted the ring of sheltered water. But insular authorities say whaling captains charted them, and the Interior Department has long known them. There's plenty of islands, but few are useful. This occupation is commercial all right, as State says. But commercial and military are very similar these days.



PRESIDENT-TO-BE: Captain Rickenbacker grins at the news that his bid for control of Eastern Air Lines has been successful. (See page 52).



PRESIDENT: W. P. Balderston, long head of the Pacific Scientific Company, is now president of the new Bendix Instrument Company.



PRESIDENT: Dudley M. Steele, for the past ten years manager of Richfield Oil Company's aviation department, is now president of United Airports Co. of California and manager of Union Air Terminal, Burbank.

MEDALIST: Richard S. Buck (left) accepts the 1937 Manly Medal from S. D. Heron, its first winner (in 1928). Buck was co-author with A. Lewis MacClain of the paper "Flight Testing with an Engine Torque Indicator", judged the best on aircraft powerplants presented before the SAE in 1937. MacClain, having received the Manly Medal for 1934, was not eligible to receive it a second time. Both men are with Pratt & Whitney Aircraft, Buck as project engineer, MacClain as chief test pilot. Presentation took place at the National Aeronautical Meeting of the SAE in Washington, March 10th.

(International)

GOOD-WILL ENVOY: Major General Frank M. Andrews, Commanding General of the GHQ Air Force, welcomes Lieut. Colonel Robert Olds back to Langley Field after his return from Buenos Aires and a remarkably few way stations. The Colonel's feat of leading his six Boeing "fortresses" on their brilliant 14,000-mile goodwill flight, tops off an excellent Army record. Born at Woodside, Md. in 1896, Colonel Olds joined the aviation section of the Signal Corps in 1917 he began flight training at the Old Curtiss Flying School, Newport News, Va. Qualifying as a Reserve Military Aviation he received his commission as First Lieutenant, Aviation Section, Signal Officers Reserve Corps on June 7, 1917, and assumed command of the 17th Aero Squadron shortly thereafter and entrained with his unit for service with the Royal Flying Corps in Canada. He returned to this country for duty as flying instructor and Assistant Officer-in-Charge of flying at Scott Field, until transferred to Ellington Field where he was successively instructor, solo stage commander, formation stage commander, officer-in-charge of flying, and officer-in-charge of training. He graduated from the Issoudon Pursuit School in France in 1918 and was transferred for duty as officer-in-charge of training at Clermont Ferrand. Then followed an assignment as S-3 on the staff of Second Army Air Service Commander at Toul, France, until ordered back to the United States in 1919. He was commissioned in the Regular Army as a 1st Lieutenant, Air Corps in 1920 and on the same day was promoted to Captain, holding this rank until 1935.

AVIATION PEOPLE

Who's Who in This Month's News

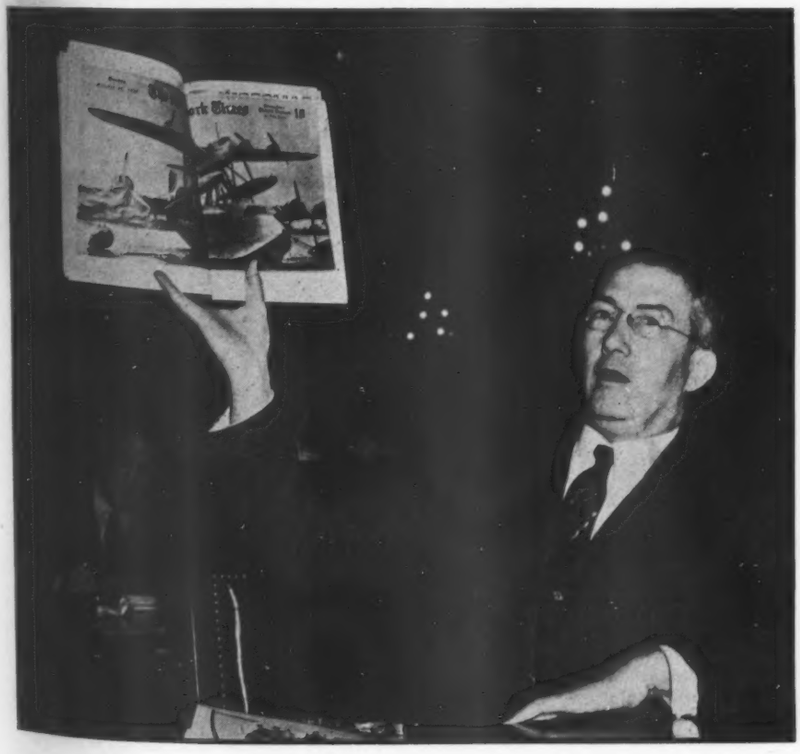
VICE PRESIDENT: Robert J. Smith, new vice president of Braniff Airways, succeeding O. M. Mosier, has since last fall been associated with Clark & Rice, Dallas attorneys. Before that he served as deputy administrator of WPA in Texas, and from 1929 to 1932 had been general traffic manager of American Airways. He is to coordinate flight, operations and maintenance activities.

(*International*)

ROLLING STONE: Vincent Schmidt, Commander of the 14th Air Squadron of the Chinese Air Force, who led the recent Chinese air raid on Formosa, is a native of Pennsylvania. He served with the American artillery during the World War. After a barnstorming interlude, he piloted for Marshall Field, III. From 1932 to 1935 Schmidt was a colonel in the 10th Route Army in China. Then he turned up at Roosevelt Field, in Ethiopia, in Paris, and in Spain.

BOSS: Malcolm L. Boss takes over the important Albuquerque post for Transcontinental & Western Air, as district traffic agent. A veteran airline official, Boss will be in direct charge of all passenger traffic at this key station on the TWA transcontinental route.

CONSULTANT: After ten years with Standard Oil Co. (N.J.), Standard Oil Development Co., and Stanavo Specification Board, of which latter he was successively Director, President, and Vice President, Major Edwin E. Aldrin will enter into aeronautical consulting work. After a trip abroad, he will associate himself with a number of aviation clients, including Standard Oil.



WITNESS: Glenn L. Martin appeared last month before the House Committee on naval affairs. Flying boats up to 250,000 pounds are already possible, he told them—and the builder of the Martin-130's and the Martin 156 ought to know whereof he speaks. (*Wide World Photo*)

LOGGING THE LINES

Air Transport Drift Sights by DAN SAYRE

Spring rates wear hangover from winter bargain spree.

We sounded off here a few months ago about the difficulty of ever getting back to old fare schedules once you start fooling with "winter only" bargain stunts. It gives us no satisfaction at all to record that last month Northwest Airlines announced that the drastically lowered fares it had put into effect "for Jan. and Feb. only" have been replaced by a new schedule much closer to its bargain rates than to its last fall's tariffs. Almost immediately, United, which had matched Northwest's "educational" project with one of its own, announced an identical set of "permanent" charges between Chicago and Seattle, Tacoma, Portland, and Vancouver.

As we remember it, the "wives free" campaigns were also to end March 1. As far as we could find out, all of them were still drifting along late last month with no one exactly sure when they could be ended. We've rather liked the idea, if only because it has smoked out a lot of cases where husbands had been blaming the little women for their non-use of air transport, when all along it was some lack of air-mindedness of their own that kept them away from the ticket offices. There are going to be some tough scenes, though for the booking agents when couples turn up and find that the whole offer has been at last cancelled out.

There are no ultimate arguments against passenger fare reduction. The boys who claim that the extra cost of airline travel is as serious an obstacle to traffic growth as any other have a whale of a good case. Some day, what with having no expensive road beds to keep up, and (praise God) no grotesque financial structures to service, air transport is going to be one of the cheapest of all methods of travel. But fare reductions must go no faster than the general advance of air transport economy. Lines losing with load factors of 50% can't make profits with load factors of 80% if the total revenue shows no increase. With prospects of better general conditions in a few months load factors should go up anyhow.

Pennsylvania Central is moving ahead in its program to equip all its planes to use the Air-Track blind landing system installed at the Pittsburgh Airport. First landings on a scheduled flight were made in Feb. and were highly successful. The F. L. Jacobs Company of Detroit (automobile parts), has recently acquired the W. I. T. Manufacturing Corporation, and its subsidiary, the Air-Track Manufacturing Corp. of College Park, Maryland. The same staff of engineers which, in developing the Air-Track system, obtained some thirty patents, will continue research and development work in the whole field of aeronautical radio.

The bad news is in on the financial statements of United and TWA. The latter went down to the tune of $959,837 compared with a net profit in 1936 of $205,126. United took it on the chin $754,487 worth, contrasted with a 1936 profit of $367,283. As we go to press American Airlines' bookkeepers had not yet announced its score, but indications are it, too, will be written in pretty pinkish ink. Only Eastern, out of the whole Big Four turned in anything positive out of the year's efforts, showing a profit of $269,982. That even beat its 1936 earnings of $182,534. Eddy Rickenbacker is receiving not only congratulations on his new financial control of Eastern (see page 52) but also the deep envy of Messrs. Frye, Patterson, and Smith.

This being the statistical issue up in front of the book, we had planned to pass over our usual report of the air transport industry's numerical achievements. Studying proofs, however, we find certain details omitted elsewhere which we had better cover. According to recent release by the Bureau of Air

YOU SHOULD KNOW: Alvin Adams (left) and Tom Wolf (above) president and vice-president of Western Air Express. Adams is 32, was born in Colorado, did well at Yale. Has held his job since 1930. Wolf is 36. Has background with Post Office, National Air Transport and United. As a side line he runs one of the largest sheep ranches in Wyoming.

Commerce, passengers carried by domestic lines last year reached 1,102,707 compared with 1,020,931 carried in 1936. Passenger miles flown reached 476,603,165 compared with 435,740,253. It must be borne in mind that this is not all revenue traffic, but includes about 14% of company personnel flying and general pass traffic. Just how the airlines managed to do so badly in a financial way despite this increased traffic emerges from the statistics of passenger-seat-miles flown. In 1936, the per cent of such seats occupied (including passes) was 64%; in 1937 it fell off to 58%. Miles flown rose from 63,777,226 to 66,071,507. The average speed for all the domestic airlines at the end of the year was 153 m.p.h. (that's block to block). The average passenger's trip had climbed to 432 miles.

Pan American Airways traffic through Miami has been breaking all records this winter. Last year's over-all figures showed an increase of 34% over 1936. On Washington's Birthday nine incoming planes brought in 199 passengers. Nine departing ships took out 201. It drives statisticians nuts to try to get any sort of complete figures on Pan American business. But Department of Commerce figures just released showed that our "foreign extension" routes flew 10,924,656 miles last year compared to 9,526,610 in 1936; carried 164,873 passengers compared to 127,038; logged 73,025,242 passenger-miles compared to 56,003,800. That's generally a much better increase than the domestic lines turned in.

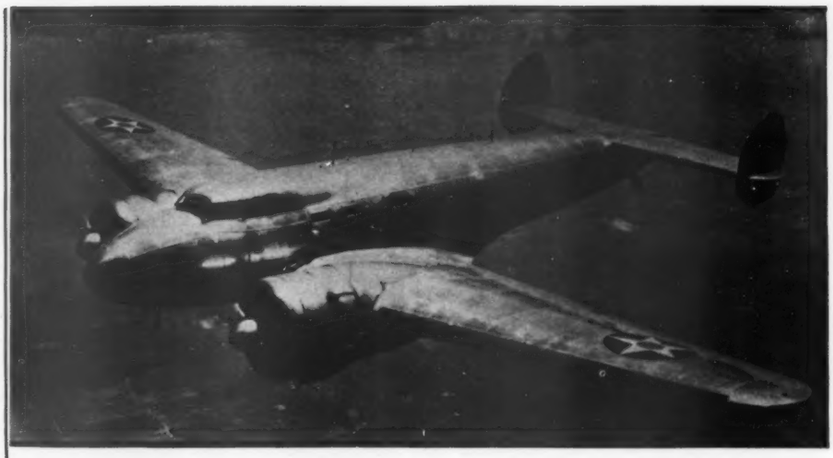
AIR TRANSPORT INDICATOR

March 1, 1938

119.8

Which is the ratio of the revenue passenger miles reported by the Air Transport Association as carried by all domestic airlines during February, 1938, to the corresponding figure for February, 1937.

For the second straight month the index stands above 100 although the ratio was less than the 150.6 registered in January. February passenger-miles logged reached 24,155,335. The total for the first two months of this year is incidentally just one third above the corresponding 1937 traffic. The 1938 figure is 53, 266,135.



Finds More Worlds to Conquer

Lockheed adds military craft to brilliant transport line

Lockheed Aircraft Corporation, BURBANK, CAL., is entering on a major program of military aircraft manufacture according to an announcement by Robert E. Gross, president. To reach its present peak in aircraft manufacturing, Lockheed has reversed the program followed by most other large airplane builders who have built their plants largely through government orders for military aircraft, and have then turned to the commercial field. Lockheed has concentrated on the production of twin engine transports of medium size since the introduction of the Electra in 1934. Now, with Lockheed transports in private and airline service throughout the world, the Lockheed company will vigorously enter the world's military aircraft market, according to Gross. First Lockheed to have a military flavor was the XC-35 stratosphere plane built for the U. S. Army. A modified Electra, the XC-35 is a development of great importance to the future of high altitude flying by both transport and military craft, but it is primarily a transport-type plane. Other military Lockheeds are the personnel transport version of the Model 12 entered in a current Air Corps competition, and the modified Model 14 cargo plane currently under consideration by the Air Corps. The former is intended for high speed transportation of military executive personnel, while the latter plane is intended for aerial supply work, such as transportation of spare engines, etc. Soon to be announced, however, is a new tactical type Lockheed designed to meet Army Air Corps needs. No information has been released. Not even a hint as to the type and purpose of the new Lockheed is at hand, but best guess is that it will be a bomber version of the Model 14. There have been other rumors, but the adaptability of the Model 14 design to high speed long range bombardment work, makes the bomber guess the most likely of all.

The present Lockheed Aircraft Corporation was formed in June, 1932, succeeding the former Lockheed Airplane Company which had been in existence since 1916 and which was best known for its wood planes of Vega, Orion and Sirius type. The new firm introduced the all-metal Electra twin engine transport in 1934, the Model 12 in 1936, and the Model 14, world's fastest multi-engine commercial transport plane, in 1937. With success of its metal transports the Lockheed firm has skyrocketed in size, current payroll of more than two thousand persons comparing with twelve hundred in January 1937, and four hundred in January of 1936. Present backlog of unfilled business exceeds $6,200,000 and includes orders for 75 Model 14 transports in addition to a number of Model 12s and Electras. Planes on order are for eleven different airlines, all but one being foreign firms, as follows: British Airways, L. A. R. E. S. (Rumania), LOT (Poland), Northwest Airlines, Trans-Canada Air Lines, KLM (Holland), KNILM (Royal Netherlands Indies Airways), Guinea Airways, Aeropout Jugoslavia, Argentine Army, and Linea Aeropostal Venezolana. A number of planes are also on order for private firms or individuals. Present officers of the Lockheed Aircraft Corporation are: Robert E. Gross, President, Treasurer, and Chairman of the Board; Carl B. Squier, vice president and sales mgr.; Hall L. Hibbard, vice president and chief engineer; Cyril Chappellet, secretary; R. P. King, ass't. treasurer; L. W. Wulfekuhler, ass't. secretary; R. A. Von Hake, factory superintendent; R. Randall Irwin, personnel director; James V. Griffin, public relations director.

Plane shown in illustration at top of column is the XC-35 now Wright Field's sub-stratosphere lab.

AS OTHERS FLY IT

A Birdseye-View of Aviation Abroad

It's wonderful how all the countries working twenty-four hours a day arming in the air still find a few minutes at lunch time to do a little export work. . . . The Italians are following up their South Atlantic flights with an intensive military sales program in Central and South America. They presented the Brazilian War minister with a nice sample—the airplane in which Bruno Mussolini flew the Atlantic. A group of military aviators from San Salvador is going to Italy for free instruction—and maybe will see an Italian airplane or so while there. . . . Germany meanwhile has been making commercial hay by selling some Junkers Ju. 52's to the new Compania Aeronautica Uruguaya S. A.; the first export Ju. 90's to South African Airways; some Ju. 86's to the South African Air Force; a lot of scattered South American business. Export subsidies make her a hard competitor. . . . Even poor old England has been able to get up some planes for the Turkish State Airlines, for the new Primeras Lineas Uruguayas de Navegacion Area, and for a couple of other old customers.

Balloon barrages will be ready for London soon. Five thousand men to man them will be recruited this spring from those unfit for active military service, and most of the material is already delivered. Designed to keep attacking bombers from sneaking through below 10,000 feet, where fighters and anti-aircraft might have trouble spotting them, they also serve to persuade Londoners that the government is doing its best to protect them. . . . The home air force is now up to 123 squadrons and still going strong—distribution by types is about the same as in 1936 (roughly 10 per cent each observation and army cooperation, 30 per cent fighter, 50 per cent bomber); showing that no great change in strategic theories has resulted from watching the minor-league wars now going on. . . . Our Air Corps had better find out how the R.A.F. filled last year's quota of 1,750 new pilots in nine months, making 4,500 since expansion began in 1935. . . . The combined maneuvers at Singapore were publicly announced as proving that base impregnable to attack from any existing foreign bases. The proof may not have been as 1-2-3 as all that, though, for three more squadrons will be sent there, and there is talk of balloon barrages.

The world airline map hasn't changed much in the last month—most of the projected extensions mentioned recently are still in the paper stage. . . . Australia has given K.N.I.L.M. a concession to extend into her territory,

Wide World

OLD TIMER: General Victor Vuillemin, new chief of the French army air service is one of the most experienced aviators in that country. After 13 years in the artillery he transferred to the air arm in 1913, qualifying for his pilot's license. Although serving throughout the War in reconnaisance and bombing squadrons he is credited with bringing down seven enemy aircraft. Since the Armistice his exploratory work in the Sahara has made him one of France's leading desert flyers.

beginning by July 1. . . . Transcanada Airlines has been authorized by Canada to establish connections with U. S. lines and to buy into the company which will operate the transatlantic air service. Ground work is almost completed on the western section of her transcontinental route.

1938 North Atlantic equipment is beginning to take shape abroad. In England the eight additional Empire boats recently ordered will be beefed up to 53,000 pounds gross weight, 8,000 over last year's tests. About 5,000 of this will go to payload, the rest to structure. Power will not be increased—if they can't get off with this load they'll probably be refueled in the air; Imperial Airways has been practicing at this recently. . . . In addition at least one trip by the piggy-back "Mercury" seaplane should be expected. Since there's only one downstairs part of the combination in captivity, the "Mercury" will probably have to return by easy stages. . . . Air France Transatlantique will also divide its eggs, ordering two CAMS 161's and three Latecoere 631's—six engined boats—none of which have been completed. M. Serre, equipment director of Air France and advocate of the Loire SE 200, resigned from the technical commission as a result of its choice. . . . Meanwhile the French have been to Pan American Airways to charter a Boeing 314 to get the line going. The rumor in Europe is that Pan American has offered them the last of the six under construction, which leaves the French about where they were before. . . . They have received the first of the five LeO H47 boats for the South Atlantic passenger service—three are expected by July to open the line, carrying eight passengers at about 200 mph.

A 120 degree pitch change propeller made by Ratier has been tested on the four engined French flying boat CAMS 141. For maneuvering on the water the outboard propellers are set for thrust astern and the inboard for thrust ahead—by working the throttles the boat can be sent in either direction or spun aroad short. Engines are warmed up at zero pitch—all meaning easier and safer water handling.

French air rearmament seems to spin around in one place, too. Frenchmen agin the government say it's production trouble from nationalization of the industry and the new labor laws—those for the gov't say it's plain lack of money. So far the move has mainly been to roast everyone concerned over a slow fire in the Chamber of Deputies, but that didn't seem to get the airplanes built. Present military production is about 40 a month with about 40,000 employed—compare this with about 95 transport and military planes plus 170 light planes per month, 36,000 men, in the U. S. in 1937. What worries the French is their belief that some 80,000 Italians and 100,000 Germans are working overtime turning out military aircraft. . . . A recent survey claims that present production capacity without any change in the system is 140 planes a month, and says all that's needed to give Chief of Staff Gamelin the 2,000 he wants by the end of 1939 is some money to build them. Apparently this view, sweetened for the opposition with a few promises of reform in the government operated factories, has won out. The budget has been changed to call for an extra appropriation for the air force amounting to $52,000,000 earmarked for new equipment. Most likely this disposes of the stories that France was about to place large military orders in the U. S. With a sockful of francs, there is now talk of 1,600 planes this year. . . . Meanwhile the French air force piled up 430,000 hours in 1937—28,000 at night—up about 15 per cent from 1936.

Refrigerated wind tunnels are the latest tool in icing research. One at Göttingen in Germany gets down to twenty below and has a versatile spray that can imitate any atmospheric condition. . . .

No details are available for comparison with the 7½ by 3 foot icing tunnel of the N.A.C.A.

Layer cake blind flying in England is laid down in new Air Ministry regulations. The air from 3,300 to 18,600 feet is divided into zones, each subdivided into twelve layers, one for every 30 degrees of compass courses. When visibility is under 1,100 yards everyone has to get in his proper layer. . . . Also from England comes news of a "magic bottle" for blind flying—a hookup using a cathode ray tube to indicate position on a map in the cockpit. It operates by automatically taking bearings on two radio stations.

Diesel powered fighters are under test abroad. Germany claims over 325 mph. for a new Heinkel that lugs two cannon in the wings and two high caliber machine guns around behind a 685 H.P. Junkers diesel. . . . The French, not to be outdone, have a Clerget diesel in a Morane fighter.

Air mail at train mail postal rates is the new regulation on internal lines in France, already put into effect on the Paris-Marseilles route. . . Six months figures on England-South Africa mails show the results of the All-First-Class-Empire-Mail-By-Air scheme—air mail loads up to ten times what they were, all first class mail up 5 per cent.

More details on the Stoppani crash off the Brazilian coast are now in. First reports (AVIATION, March) laid it to an explosion in flight while dumping gas preparatory to a forced landing. Later information is that fire broke out at 10,000 feet following a backfire—the plane was landed without injury but exploded on the water. Also in the final list of victims was Captain Viola, commander of the Italian aerobatics squadron barnstorming South America. . . . An unusual accident destroyed the German aeronautical pride and joy, the four motored Ju. 90. During high speed tests with an artificial vibrating device in the wing (a common practice at Junkers to imitate bumpy air and power plant vibration) the vibrating device ran away and the crew was forced to jump, one of the test engineers being killed by his chute opening too late. . . Recent accidents in the Mediterranean hit both France and Italy. A four engined flying boat of Air France struck a breakwater taking off in a fog at Marseilles, killing eight and injuring four. A Rome-bound seaplane of Ala Littoria disappeared in a storm on its way from Cadiz.

Planes Fight Flood

(*Continued from page* 52)

by all the airlines. Due to washouts of main trunk lines none of the telegraph companies were able to handle wire business, which was abnormally high due to flood conditions. Consequently hundreds of pounds of telegraph messages were flown out to San Francisco, Salt Lake, or San Diego, there to be transmitted over the regular wire systems, and incoming wires were handled in the same way. All of the lines sent out survey planes immediately after the storm, carrying relief workers, newspaper men, and photographers, to seek out refugees stranded in isolated sections and so help direct ground aid. Further relief work was done directly from the air when food and supplies were carried and dropped to isolated groups in mountain canyons. Benny Howard, United's flying researcher, had charge of this phase of the relief work. American Airlines ran six planes each way daily on Friday and Saturday following the storm, carrying more than one hundred passengers each way both days. As with the other airlines American had to rely completely on their own radio system for transmission of weather data and company messages, as the teletype lines were out of service. American was able to handle many commercial telegraph messages also over its radio system, in addition to flying a great quantity of such messages back and forth between Los Angeles and Phoenix, where wire service was available. On Friday American Airlines resumed service to Palm Springs, heavily populated with screen notables at this time of the year. The popular desert resort was completely cut off from the outside world and a large shipment of bread and of milk was taken in by air, as well as a short wave radio set for communication purposes. Another unusual service was rendered by Western Air Express in spotting lost trains. A number of trains of various rail systems became isolated due to wash-outs and, in the absence of telegraph service, train dispatchers had no information on the location of their trains. Western Air Express pilots located a number of trains from the air and then radioed in their position.

AVIATION BOOKS

In Tabloid Review

AIRPLANE SERVICING MANUAL, *by Victor W. Page;* The Norman W. Henley Pub. Co., New York, 1938; 987 pages, $6.00.

One of the most comprehensive books on the subject that has been published. The author has gathered together a vast amount of practical information from many sources, and has done well in the matter of selecting up-to-date pictures to illustrate his points. A "must" for the shelf of anyone who has to do with operating or servicing airplanes.

AERO ENGINES, DESIGN AND PRACTICE, Volume 2, Handbook of Aeronautics, *by Andrew Swan;* Sir Isaac Pitman and Sons, Itd., London and New York, 1938; 474 pages, $7.50.

First published in 1931, the present volume is the third revised edition of the engine unit of a series of aeronautics handbooks published under the authority of the Council of the Royal Aeronautical Society. Subject matter ranges from the extremely theoretical considerations of stresses and vibrational modes in crankshafts to practical methods of de-icing carburetors or to proper warming-up procedure. Based largely on Reports and Memoranda of the Aeronautical Research Committee, and on other Air Ministry material, the viewpoint is, of course, thoroughly British. But the book is easily comprehensible to American readers once they have mastered the simple technique of reading "propeller" for "airscrew" and "gasoline" for "petrol."

FEEDING TIME? Not quite. Picture shows a long spar being loaded into one of the new Fleet Freighters (Fleet Aircraft, Ltd. of Fort Erie, Ontario, Canada). Designed for cargo haulage in the far north, this machine is equally at home on wheels, floats or skiis. Power plant consists of a pair of 285 hp. Jacobs engines swinging Curtiss-Reid props. Description in an early issue.

THE REPORT CARD

Of Air School Developments

» On April 4th Ryan School of Aeronautics (San Diego, Cal.) will open its new Engineering School offering two courses in engineering. A one-year engineering course features practical aircraft design and construction. A two-year course, more extensive in its scope and even more intensive in its practical application, gives complete aeronautical engineering training.

Selected to head the new Ryan Engineering School is Stanley H. Evans, internationally known aircraft designer and educator, who comes to Ryan from the Northrop division of the Douglas Aircraft Company after a distinguished career of more than twenty years in aviation on both sides of the Atlantic. Evans flew with the English Royal Flying Corps during the World War; later completed his engineering training at Oxford and London Universities, and served on the engineering staffs of such firms as Koolhoven in Holland, and Handley Page and Gloster in England. Adopting America as his foster country Evans came here in 1928 and has been associated with the Douglas Aircraft Company, and also organized and directed the engineering school of the Curtiss-Wright Technical Institute, Glendale, Calif. Evans is credited with much original work in connection with the development of slot and flap systems and of the gull-wing design for military aircraft. He is an Associate Fellow and Pilcher Prizeman of the Royal Aeronautical Society, a Member of the Institution of Aeronautical Engineers, and an Associate Fellow of the Institute of Aeronautical Sciences.

SCHOOLMASTER: Stanley R. Evans now heads up Ryan's new course in Aero. Engineering.

» MR. GEORGE IRVIN, president of the Irvin Aircraft Mechanics Association, of San Diego, California, operators of an approved aircraft instrument school, has announced establishment of a Los Angeles branch operated in conjunction with the Aeronautical Institute of Technology.

» CONNECTICUT STATE COLLEGE and Pratt & Whitney have organized a course of engineering training for apprentices employed in the P & W factories. Each apprentice is to receive at least six hours of instruction a week in college engineering subjects. Thirty-seven apprentices are enrolled in the first term of the course, which began this month. Costs are borne equally by the students and Pratt & Whitney.

» JESS D. GREEN, director and general manager of the Spartan School of Aeronautics (Tulsa, Okla.) announces the school has taken over the former TWA hangar adjacent to the school's hangar No. 1. With the largest enrollment in its history, and with the inauguration of night classes and a Latin-American division, the 40,000 square feet of additional floor space will be fully utilized. A new and elaborately equipped meteorological laboratory is to be established atop the new building.

» THE STATE-FINANCED AVIATION SCHOOL for Tennessee will be conducted in Memphis, by the Vocational Division of the Memphis City School System. Mrs. Phoebe Omlie will serve as an instructor when classes start March 22. During the three-month course, students will be divided into classes to meet on different nights. Material will be provided by the state but some deposits will be required. The 15 receiving the highest grades will be given advanced training.

» PARKS AIR COLLEGE (E. St. Louis, Ill.) has announced a new course, Maintenance Engineering, to supplant its Master Mechanics Flight Course. It is to lead the student through a more thorough course in engineering fundamentals than its predecessor, yet retain full practical training in all departments of airplane and engine maintenance. Open to high school graduates, it will require 96 weeks for completion.

» BOEING SCHOOL OF AERONAUTICS (Oakland, Cal.), in order to clear up all misunderstandings of its entrance requirements, has summarized them as follows:

A physical examination is required only for those planning to take flying courses.

For the Airline Pilot and Operations Course, the Airline Operations Course, and the Airline Mechanic Course, a high school education or its equivalent is sufficient.

For the Airline Technician Course and the Airline Dispatching and Meterology Course, the applicant must have graduated from an accredited four-year college course in aeronautical, civil, mechanical, electrical, industrial, mining or chemical engineering.

Candidates for the Air Transport Engineering Course, Practical Aeronautical Engineering Course, and the Airline Flight Officer Course must have finished two years of an accredited college or junior college.

THE FLIGHT PLAN

Of Coming Events

DETAILS are out for National Air Mail Week to be observed May 15–21. Paul R. Younts, Charlotte, N. C. postmaster is to serve as national chairman. State, district and local units are to be set up to reach 46,000 communities.

PURPOSES ARE: To commemorate the twentieth anniversary of the inauguration of the air mail service that was started by the Post Office Department May 15, 1918; to educate the citizens in the use of air mail, showing its progress, dependability, safety and value, and, to increase the use of the air mail, to the end that through increased revenues still further expansion of this now essential service will be made possible.

PLANS have been completed for an early-summer air race meet at Oakland Municipal Airport, California, under the direction of James R. Ewing, manager of the St. Louis, Miami, and Denver air races. The meet will be held June 10–11–12. Pilots who have already signified their intention of competing are: Art Chester, Marion McKeen, Gus Gotch, Harry Crosby, Lee Williams, Russ Chambers, Earl Ortman. Roscoe Turner, Joe Jacobson, S. J. Wittman, and others are expected to enter. New planes are now being built by Crosby, Williams, Chester, Chambers and Jacobsen, and it is believed that all of these and perhaps one or two other new race jobs will show up at Oakland.

KEEP IN YOUR DATE BOOK:

The Third Annual Aircraft and Boat Show, Los Angeles.....April 2–10
Northeast Regional Conference of the N.A.S.A.O., Providence, R. I..April 5–6
Southeastern Planning Conference, Montgomery, Ala.....April 14–16
Intercollegiate Flying Conference, Washington, D. C.....April 16–17
National Soaring Contest, Elmira, N. Y.....June 25–July 10
National Air Races, Cleveland, Ohio .....Sept. 3–6

Aircraft Radio

New Equipment for Communication and Navigation by Henney and Fink

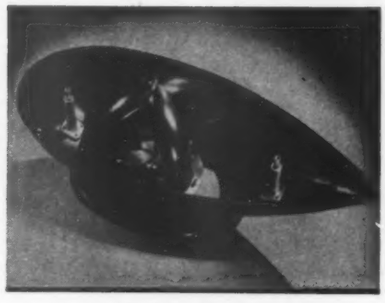
"Radioguide"

Double-loop direction finder employs two-channel receiver.

UNDER THE NAME "SIMON RADIOGUIDE", a new crossed-loop direction finder has recently been put into production by the Radio Navigational Instrument Company, 500 Fifth Ave., New York. The direction-finding element in the new unit is shown in the accompanying photo. It consists of two separate loops, mounted at right angles, and encased in a stream line housing. As the radio wavefront passes the loops, it induces in them two voltages, the ratio of which depends on the bearing of the loop with respect to the plane of the wavefront. The two voltages are amplified separated in two channels of a double-channel superheterodyne, and are then combined in a cross-pointer indicator which gives the direction of the signal with respect to the axis of the plane. The indicator contains two pointers, each of which indicates the signal strength received by its loop. The intersection of the two pointers then gives the direction of the incoming signal.

The receiver is tunable to three frequency ranges: 200-400 kc., 500-1000 kc., and 1000-2000 kc., which includes all radio range beacons, all broadcast stations, and some short-wave stations. The loop is rotated by a remote control mounted on the instrument board. The indicating instrument is mounted in a standard case. The equipment, complete, weighs approximately 60 lb.

Installations of the unit have been made on the Bureau of Air Commerce Lockheed Electra HS-1 for test, on planes in Russia and Poland, and on sleeper plane of American Airlines.



Simon Radioguide

Dial-Tuned

A new transmitter for air-liners developed by Collins

FOLLOWING TWO YEARS OF DEVELOPMENT WORK, The Collins Radio Company of Cedar Rapids, Iowa, has put on the market a high-power transmitter intended for use on air-liners. The new transmitter goes under the name Model 17D, and features the "Autotune System", whereby any one of ten frequencies are made available to the pilot by a dial mechanism very similar to that used in the dial-type telephone.

The specifications of the transmitter include the following:

Power output: 100 or 175 watts.

Tuning Range: 2,800 to 12,000 kc.

Weight, complete less dynamotor: 59½ pounds.

Battery drain: 100 per cent modulated,
95 amps. for 100 watts
107 amps. for 175 watts
Stand-by, 6 amps.

Tubes: C100D oscillator, 807-buffer, 2-807 intermediate amplifiers, 1-C120 power amplifier (C201 for 175 watt operation), 2-C120 modulators and 2-6F6 speech amplifiers.

Audio fidelity: 300 to 3,000 cps, within 1 db., sharp cutoff at 300 cps.

The Autotone system consist of a set of variable condensers and coils which are arranged for continuous tuning from 2800 to 12,000 cps. The frequency of operation is selected by a dial mechanism, the desired frequency being selected within 3½ seconds after the dial is acuated. The tuning is accomplished by a fractional-horsepower motor which drives four shafts. Rotating with each shaft is a cylindrical arrangement of ten stop-rings, each of which engages a stop at a position corresponding to the desired frequency settings. Three of the shafts drive three variable condensers in the oscillator and amplifier circuits, while the fourth operates a coil-tap switch. Another small motor selects the ten crystal frequencies, and at the same time sets the stop which engages the stop-ring arrangement. Reset accuracies of plus or minus 0.05 degrees of rotation are obtained under wide variations in battery voltage, temperature changes, vibration, etc.

Dialing is accomplished by a ten-position dial, connected to a rotating selector switch. When a given dial number is dialled, the first motor drives all the stop rings to the reset position, then the second motor drives the stop to the proper level to engage the stop-rings required for the frequency dialed, and finally the first motor rotates the stop-rings until they engage the stop, when all coils and condensers are tuned to the desired frequency.

High level class-B modulation is used. The restricted frequency range eliminates much of the unwanted noise, but includes the essential voice frequencies. Distortion is limited to 5 per cent. to insure maximum clarity.

Collins Dial-Tuned Transmitter

NORTHWEST *WINGS*

Northwest Airlines is known as "The Yellowstone Valley Route." Northwest's Sky Zephyrs offer fast, luxurious service between Chicago and the Pacific Northwest.

★ ★ ★

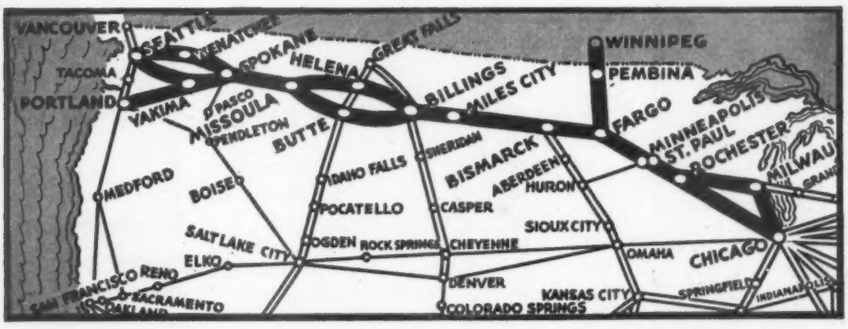
Texaco Asphalt makes resilient, rugged, economical surfaces for airport runways, hangar floors and aprons, driveways and parking areas.

NEW TEXACO

THROUGH WESTERN SKIES

ON

TEXACO



This map shows Northwest Airlines' route between Chicago and Seattle. Sub-zero winters and sizzling summers make this super-scenic territory tough on engine oil. Northwest uses New Texaco Airplane Oil.

• Operating between Chicago and Seattle, NORTHWEST AIRLINES flies through one of the most scenic sections in the United States. As an aid in flying this beautiful country, NORTHWEST continues to use New Texaco Airplane Oil.

New Texaco Airplane Oil has amazed the entire aviation industry by its virtual elimination of engine wear. Keeps rings free in their grooves, valves working properly, maintaining compression and saving fuel.

Intervals between required overhauls are extended. *More scheduled airline mileage is flown with New Texaco Airplane Oil than with any other brand.*

You may order Texaco Aviation Products at all important airports. Prompt service assured through 2108 warehouse plants throughout the United States.

The Texas Company, *Aviation Division,* 135 East 42nd Street, New York City.

TEXACO
REG. T. M.

AIRPLANE OIL

Buyers' Log Book

What's New in Accessories, Materials, Supplies, and Equipment

Fognozzle in use

Fognozzle for Aviation

A new method of fire extinguishment

BASED ON YEARS OF USE a new type of fire fighting is brought to the avation industry by the Fog Nozzle Company, 1520 East Slauson Ave., Los Angeles, California. Particularly suited to fighting fire involving liquid dopes, petroleum products, or airplane crash fires, the Fognozl equipment is based on the use of water alone, although it may be used to advantage in conjunction with CO_2 in certain types of fires. Developed by Battalion Chief Glenn G. Griswold, of the Los Angeles County Fire Department, the Fog Nozzle atomizes water into a fine fog, this process being accomplished with ordinary pressures such as are available from most water mains and fire hydrants it is practical to use the Fog Nozzle with portable water tank trucks on airports, etc.

Fognozls are available in a wide range of types and may be used for portable hand nozzles, or on permanent ceiling or tank installations for automatic fire extinguishment. The Fognozl principle of fire extinguishment is rapid cooling of the gases of combustion, which results in almost instant reduction of heat in the fire area and makes it practicable for the operator to walk directly up to the hottest fire and fight it at close range. In the case of airplane crash fires the Fognozl permits the fire fighter to throw a cooling screen around any personnel trapped in the wreck. Also, in such a case, the screen of waterfog protects the trapped personnel from any harmful effects of CO_2 or other fire fighting chemicals in use at the time.
—AVIATION, *April, 1938.*

Skyview Camera

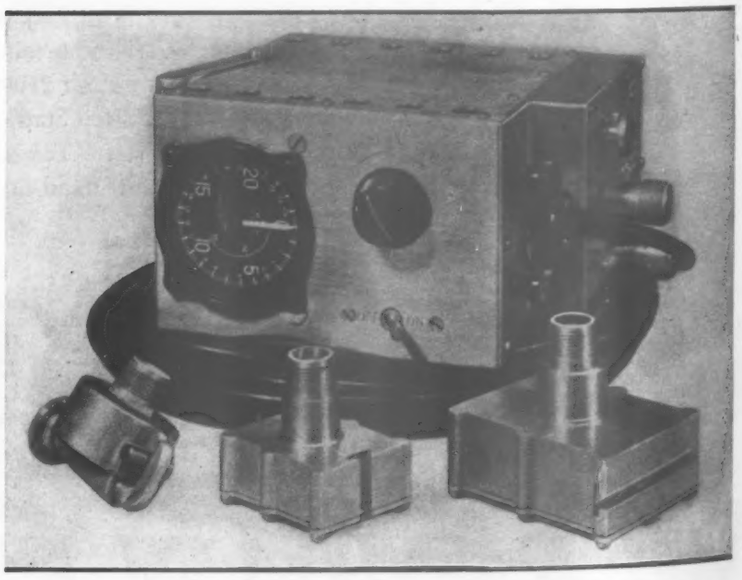
New model designed for private flyers

DESIGNED primarily for private pilots, the latest addition to the line of the Skyview Camera Company, Cleveland, Ohio, is styled the Model K. Like the larger Model D, it is an all purpose unit designed for use in the air and on the ground. A little more than six inches long, the Model K weighs two pounds five ounces and uses 2¼x3¼ filmpack. It is equipped with a specially made Wollensak f4.5 lens, Skyview shutter with speeds of one-half second to one-hundredth second, and accurate focusing from six feet to infinity.—AVIATION, *April, 1938.*

Viabration Meter

Sheffield Gage offers device covering wide frequency range

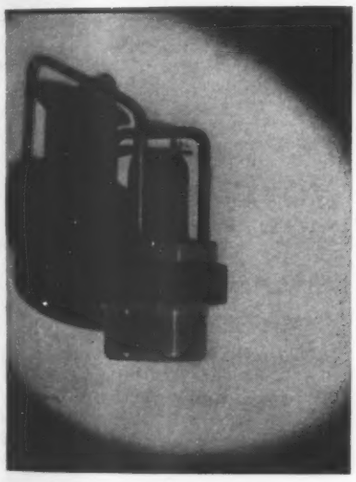
TO DETERMINE the vibration resonances of wing, fuselage, engine mount, propeller, and other units, and the loading of wires and rods, the Sheffield Vibration Frequency Meter has been developed by the Sheffield Gage Corporation, Dayton, Ohio. In its standard form the device has a frequency range of 125-3000 cycles per minute and, with modifications the range can be expanded to 50000 or more cycles per



Sheffield Vibration Frequency Meter and accessories

minute. Developed by aviation engineers this device has been used by both military and commercial air services.

For use as a tensionmeter, vibrations are generated by an eccentric rotor driven by a flexible shaft. The rotor is in a housing having an integral attachment clamp. For determining reasonant frequencies of larger units the vibration's generator consists of a square weight, reciprocated by a crank operating in a slot, or Scotch yoke within the weight. It is driven by a flexible shaft and has a housing and clamp. A variable speed D.C. motor with a high precision tachometer, completes the instrument.—AVIATION, *April, 1938.*



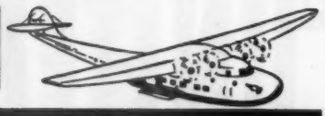
Remington Detector

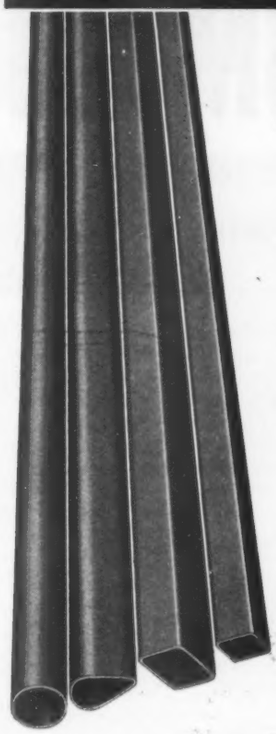
Fire Detector

Remington device uses .22 calibre rifle shells

A NOVEL FEATURE of the Lux Fire Detector System manufactured by Walter Kidde and Company, Bloomfield, New Jersey, for use in aircraft, is the use of .22 caliber rifle shells as the detector unit. The shell is specially manufactured and has no bullet or powder charge, but retains the primer charge in the base. The detector unit is so placed that any temperature greater than 250 degrees F. will fire the shell, which flashes a signal along a tube to the pilot's cockpit, or is so hooked up that the fire extinguishing system is automatically brought into play. The fire extinguishing system is the standard Lux pressure tank and distribution system by which the CO_2 gas is piped into the engine compartment, where it snuffs the fire out at its source.—AVIATION, *April, 1938.*

PROOF OF DEPENDABILITY



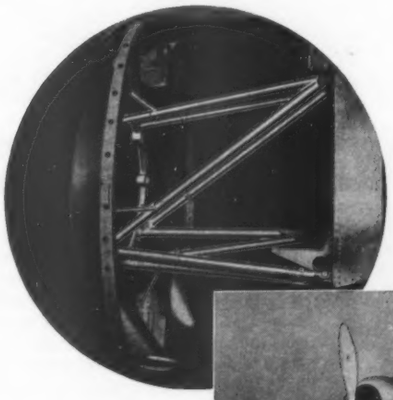


IN AIRCRAFT TUBING
Can Only be Measured by
PERFORMANCE

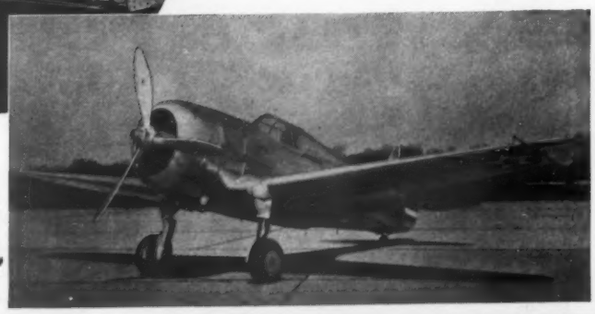
Not content with having led the way to the present established Army and Navy standards of Chrome Molybdenum 4130-X Steel tubing for tubular fuselage construction, "Ohio" metalurgists and craftsmen pushed on to greater accomplishments.

Today "Ohio" controlled atmosphere annealing and normalizing process gives "Ohio Special Quality" Tubing additional factors of safety in aircraft construction. Where safety is paramount, manufacturers bank on Ohio's performance record.

"Ohio Special Non-Oxidized" Aircraft Tubing is now Standard in the round and streamline sections as well as special shapes.



It took "Ohio Special Quality Non-Oxidized" seamless tubing to stand the weight and tremendous stress of the thundering 1000 H. P. engine of the New Curtiss P-36A Army Pursuit Planes.



Specify:-
"OHIO SPECIAL QUALITY NON-OXIDIZED"

The OHIO SEAMLESS TUBE Co.
SHELBY, OHIO.

"UNITED" LANDS SMOOTHER _ STOPS SMOOTHER WITH

United 'Mainliners' Now Protected by "Teamwork" Control of Both Goodrich Low Pressure Tires and the New Goodrich E. T.* Airplane Brakes

SINCE its earliest days, United Air Lines has been among the first with new developments in air travel. Years ago United Air Lines adopted the extra safety and smoothness of landings on Goodrich Airplane Silvertowns. It was among the first, too, to give passengers the important protection of Goodrich DE-ICERS, the remarkable safety invention that makes on-time, on-schedule flying possible regardless of freezing weather and high altitudes. And now another Goodrich engineering development . . . the new Goodrich *Expander Tube* Brake . . . is here to give landings that are safer, smoother than ever!

Because Goodrich Airplane Silvertowns are engineered on the low pressure principle they instantly adapt themselves to an endless range of loads, speeds and landing surfaces. And when "teamed" with the new Goodrich E. T.* Brakes the outcome is more flexible landing control for all types of planes—whether commercial giants or light sport planes.

125 MILLION MILES OF FLYING! That's United Air Lines' record —an international "high" in air line operation! And in flying its New York - Chicago - California and Seattle - San Diego routes with both day service and overnight coast - to - coast sleepers, United Air Lines adds 50,000 miles to this record every day!

Over 40 Aviation Products

Remember—the same engineering ability that developed the Goodrich Airplane Silvertown, the Goodrich DE-ICERS, and the Goodrich E. T.* Airplane Brake has also gone into the making of over 40 Goodrich products used by the world's top flight pilots, plane makers and air lines. Write Dept. 651, Aeronautical Division of The B. F. Goodrich Co., Akron, Ohio, for complete information. Ask for a copy of "Goodrich In Aviation."

**Expander Tube*

NEW GOODRICH *EXPANDER TUBE* BRAKES ON ALL MAINLINERS!

• Again Goodrich proves its leadership in developments for aviation. The new Goodrich *Expander Tube* Brake has been acclaimed one of the greatest forward steps in more efficient braking for all types of planes. Not only does this new brake give uniform pressure against the brake drum at all times but it *automatically adjusts itself to offset lining wear!* And remember, whether your plane is licensed for one passenger or fifty, there is a Goodrich E. T.* Brake for your requirements. If you want safer, smoother and quicker braking under all conditions, specify Goodrich E. T.* Airplane Brakes.

Read what J. A. Herlihy, United Air Lines' Director of Engineering, says:

UNITED AIR LINES

"Goodrich *Expander Tube* Airplane Brakes are used on all of United's 38 Douglas DC-3 Mainliners, including the exclusive Skylounge type and the Sleeper planes. Our experience with these brakes has been very satisfactory and shows their operation is smooth and reliable. In addition to these two important factors, our pilots like the flexible control features."

J. A. Herlihy

Director of Engineering

WITH GOODRICH TIRES.....
NEW GOODRICH E.T.* BRAKES

ICE "KEEP OFF"—No ice is allowed to loiter on the propellers or wing edges of United 'Mainliners.' That's because Goodrich DE-ICERS keep it constantly "on the move." The special "spinner" and "slinger ring" assembly shown at the left constantly bathes the blades with a solution that defies formation of ice. And on the leading edges of wings the pulsating Goodrich rubber "shoes" automatically crack ice, which blows away as soon as it forms. Thus Goodrich DE-ICERS give *complete* protection.

Goodrich *Airplane* Silvertowns

THE SAFEST AIRPLANE TIRE EVER BUILT

Over 40 Rubber Products for Airplanes — including Tires — Tail Wheels — Abrasion Shoes — DE-ICERS — Matting — Rubber Hose — Grommets — Shock Absorber Cord — A Complete Line of Rubber Aeronautical Accessories.

USED ON LEADING AMERICAN AND FOREIGN MILITARY AND TRANSPORT PLANES

H. D. INGALLS, Superintendent of Maintenance, AMERICAN AIRLINES, INC. and winner of Aviation's Maintenance Award, states "LIQUIDOMETER electric fuel gauges used on our flagships giving entire satisfaction".

LIQUIDOMETER GAUGES provide positive, dependable and accurate knowledge of the quantity of fuel or oil in tanks.

•

Hydraulic transmission type **LIQUIDOMETERS** used where a separate self-contained gauge is desired for each tank.

•

LIQUIDOMETER electric gauges are used where indication for a group of tanks is desired on one indicator unit. One model provides a separate dial for each tank controlled by a built-in selector switch and is particularly adaptable where there are a number of tanks of different capacities.

•

THE LIQUIDOMETER CORPORATION

SKILLMAN AVENUE AT 37th STREET LONG ISLAND CITY, N. Y.

Little Things Count

(*Continued from page 37*)

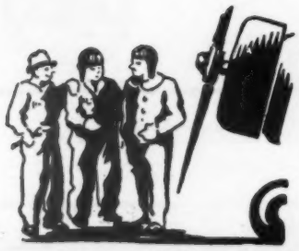
operating practices from coast to coast. William C. Littlewood, assisted by Otto Kirchner, both men of long experience in air transport engineering, head up this department.

H. D. Ingalls, superintendent of maintenance, winner of AVIATION'S Maintenance Award for 1938, heads up maintenance service and overhaul work for the entire system. From the photographs accompanying this article, which show the layout and main departments of the Chicago base as well as a number of the specialized gadgets that have been developed for certain specific overhaul jobs, one gets an impression of the amount and quality of maintenance work done to keep American's airplanes operating safely on their appointed rounds.

Such a system of control of the important little things depends greatly on rapid accurate communications, and American's communication system under J. G. Flynn, Superintendent of Communications, plays an important part in keeping the head office promptly advised at all times and in disseminating instructions.

"THE JEEP": A.A.'s mechanic Jimmy Rae invented this gadget to check operation of electrical systems on airplanes. It plugs into standard control box receptacles, indicates directly proper or improper functioning of battery, generator, and wiring. Usage is simple.

Operators' Corner



An exchange of ideas on the problems of the commercial aviation industry

QUESTION 28: What specific methods have you used to promote your business? What forms of advertising have your used and to whom has it been directed? Have you made use of contests, premiums, exhibitions and with what success? What original methods have you developed for this purpose?

Step in Right Direction

THE NEW REGULATIONS are a step in the right direction. They protect both the private pilots and the airlines, too. Naturally they will require more nearly uniform equipment for ships flying on the airlines and will require that the people who fly them have proper knowledge of the problems encountered.

Of course some private pilots with ships not equipped with radio will find the equipment needed is expensive and will object if the government steps in and requires such equipment. But by and large the regulations should protect a very large percentage of the people who fly.

It is better that the regulations be too stringent at first so that air traffic will not get out of hand making regulation more difficult. But it is always possible to revise the rules to make them more lenient. Since the highest percentage of accidents are in the private flying group it is here that the regulations must be concentrated to make them most effective.

We are complying with C.A.R. as rapidly as it is possible to do so. All of our planes have been fitted with the required equipment and our pilots are getting instrument ratings as quickly as possible.—A. C. BUSSY, *Chief Pilot, O. J. Whitney, Inc., Floyd Bennett Field, Brooklyn, N. Y.*

See Your Lawyer

THE TROUBLE with the new regulations is that they abound in legal phraseology and technicalities that are very difficult for practical operators and pilots to understand. For example, in one place there is a requirement that solo pilots doing acrobatics with an instructor must carry parachutes while in another section they state that solo pilots are not permitted to carry any property at all. Similar examples of inconsistency are not difficult to find on careful reading of C.A.R.

It is my understanding that the regulations are to be rewritten extensively and it is hoped that they will finally emerge in a much more readable form. —W. D. GUTHRIE, *President, Roosevelt Field, Inc., Mineola, L. I., N. Y.*

Special Rules for Light Ships

UNDER THE NEW REGULATIONS it becomes more difficult to get a private pilot's license because meteorology and navigation are required as in the case of the transport rating. These subjects are useful but are frequently merely memorized and later forgotten by many pilots who never have occasion to use them. It is particularly unfair to those light plane pilots who do not do extensive cross-country flying.

We do not feel that an instructor's rating should be necessary for light planes. These facts lead to the conclusion that there should be a separate set of regulations for light planes, taking into consideration the fact that there are a certain number of pilots who do not care to fly very far away from the home airport and operate for the most part within a radius of less than 100 miles. It also is regrettable that under C.A.R. no one is permitted to fly in a dual control ship unless one control is manned by an instructor.—ALFRED B. BENNETT, *President, Bennett Air Service, Hightstown, N. J.*

Next Month's Questions

QUESTION 30: Do you feel that fixed base operators need an organization to protect their interests and present their views to legislators? If so, who should be included in such an organization? How should it be supported? How should it be organized? Please answer in detail.

Sales Promotion Manager C. A. Parker of Inter-City Airlines was responsible for this window display in downtown Boston

Aircraft Radio

(*Continued from page 63*)

Re-Cirk-It Breakers—

and special housing offered by Heinemann Electric Co.

KNOWN AS THE RE-CIRK-IT BREAKER and also available with a special safety housing for protection in hazardous locations circuit breaking equipment is being marketed by the Heinemann Electric Co., Trenton, N. J. The Re-Cirk-It breaker is fully magnetic and non-thermal, available in ratings from 50 milliamperes up to 35 amperes, and for circuits operating up to 250 volts D.C. or 460 A.C.

Aerovoice

Two new high-power transmitters announced.

AS COMPANIONS to the Aerovoice D30, two new units the Aerovoice R40, a remote controlled model, and D40, direct-controlled have recently been offered. Both transmitters, except for the control mechanism, are the same. They employ a 6L6 as a stabilized crystalled controlled oscillator (3105 and 3120 kc.) which feeds an RK39 amplifier. The RK39 operates as a linear amplifier for 3105 and 3120 kc. and as a doubler for 6210 and 6240 kc. The modulator employs two 6L6's, which modulate the plate and screen of the amplifier tube. A high gain anti-noise microphone drives the grids of these tubes, through a coupling transformer, to a maximum modulation percentage of 100 per cent.

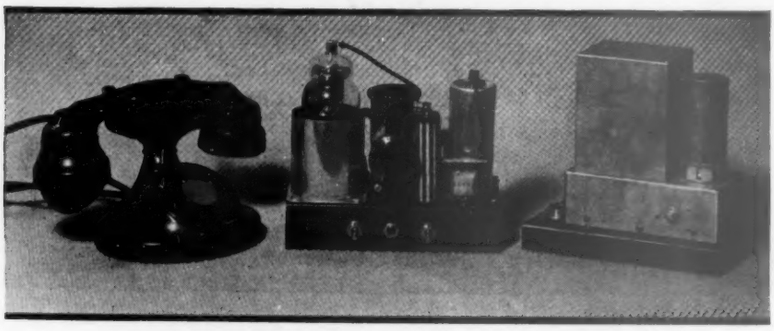
In the remote controlled model, the control unit (weighs 1¾pounds) contains an on-off switch, a four-position selector for selecting any one of the four transmission frequencies, and a toggle switch for providing continuous dynamotor operation (for cw. and modulated cw.) or stand-by operation, used for phone. This is the latter connection, the operation of the dynamotor is controlled by the "push-to-talk" button on the microphone. In the direct controlled-model, the same controls are mounted directly on the panel. An antenna changeover relay, for using a single antenna with both transmitter and receiver, is optional equipment.

Three-Watt Transmitter

Standard Transformer enters field with equipment for the private flyer

AS ITS INITIAL OFFERING in the aircraft radio field, the Standard Transformer Corporation of 850 Blackhawk Street, Chicago, announces the Stancor 10-Aero, a 3-watt, 16-pound, two-tube transmitter intended primarily for contact with airport traffic control towers. One of the smallest transmitters ever constructed for aircraft use, the new unit contains two tubes, an 802 and an 89. Two crystal-controlled frequencies 3105 and 3120 kc. are provided. Maximum modulation percentage is 100 per cent. A plate-circuit milliameter (150 ma. full scale) gives a visual indication of transmitter operation.

The unit measures 7 by 7½ by 7½ inches, and contains vibrator power supply (3½ amps drain at 12 volts or 7 amps drain at 6 volts) mounted integrally with the transmitter. If desired, the power supply and transmitter may be obtained in separate mountings, permitting the power supply to be placed near the battery, to avoid voltage loss in the leads. The controls include a power switch, filament voltage switch and microphone jack, all of which are available from the front panel. A high gain microphone and all necessary cables are supplied with the transmitter.



Three-Watt Transmitter by Standard Transformer

Timm 840

(*Continued from page 41*)

Lavatory and entry: 46 cu.ft.
Max. cabin width: 55 in.
Max. cabin height: 65 in.
Normal number of seats: six.
Weight empty: 5,281 lb.
Allowance for radio, flares, etc.: 132 lb.
Useful load: 2,387 lb.
Fuel: 180 gal.
Oil: 14 gal.
Baggage: 180 lb.
Mail: 200 lb.
Gross weight: 7,800 lb.
Wing loading: 20.3 lb. per sq.ft.
Power loading: 9.3 lb. per hp.
Power plant: (840 hp.) 2 Wright Whirlwinds R975E-3. 420 hp. at 2,200 r.p.m. at 1,400 ft. altitude. 450 hp. at 2,250 r.p.m. for takeoff.
Propellers: Hamilton-Standard constant speed.
Fuel: 80 octane.
Maximum speed: sea level, 204 mph.; critical altitude, 207 mph.
Cruising speed: 75% power, 193 mph. at 5,000 ft.; 66% power, 186 mph. at 8,000 ft. at 1,900 r.p.m.
Staling speed without flaps: 70 mph.
Landing speed sea level: 59.5 mph.
Landing run with brakes: 375 ft.
Takeoff distance with flaps: 395 ft.
Takeoff time with flaps: 10 secs.
Initial rate of climb: 1,760 ft. per min.
Time to 5,000 ft: 2.9 min.
Time to 10,000 ft.: 7.5 min.
Absolute ceiling, 2 engines: 26,200 ft. 1 engine 14,000 ft.
Endurance, at max. speed, 2.43 hr.; at 75% power 3.65 hr.; at 66% power 4.23 hr.
Range at max. speed, 500 mi.; at 75%; power 705 mi.; at 66% power 790 mi.
Fuel consumption max. speed, 74 gal. per hr.; at 75% power 49.5 gal. per hr.; at 66% power 42.5 gal. per hr.

Equipment includes: Altimeter, turn and bank indicator, rate of climb indicator, compass, airspeed indicator, 2 manifold pressure gages, 2 electric tachometers, 2 engine cylinder temperature gages, 2 carburetor air temperature gages, 2 engine gage units.
Optional at extra cost, Sperry artificial horizon, Sperry directional gyro, Cambridge exhauster analyzer unit, outside air temperature gage.

Electrical equipment: one Reading battery, one Eclipse engine driven generator, two S & M leading edge landing lights (extra), one set navigation lights, one cabin dome light, one lavatory light, one volt-ammeter, one Scintilla ignition switch.

Power Plant: One twin engine type engine primer, two Pesco fuel pumps, two exhaust collector rings, two oil coolers, two Hamilton-Standard controllable propellers (constant speed extra).

Miscellaneous—One hand fire extinguisher, one first aid kit, ash trays at each seat, one set tools, one log book and container, complete lavatory, provision for two-way radio, two 3 min. flares, 5 lb. Lux fire extinguisher in fuselage with discharge pipes to each nacelle, complete radio shielding of engines, ball bearings on all controls.

Congratulations

H. D. INGALLS
and
AMERICAN AIRLINES
on AVIATION MAGAZINE'S AWARD
For an Outstanding Contribution to Maintenance

H. D. Ingalls, Superintendent of Maintenance for American Airlines, was recently presented with Aviation Magazine's Maintenance Award, in recognition of an outstanding contribution to the field of maintenance of equipment in air transportation.

American Airlines, flying approximately 50,000 miles each day over 7,000 miles of air routes, uses Wright Cyclone engines to power all of its great fleet of 14-passenger Douglas DC-2 Day Planes, 21-passenger Douglas DC-3 "Flagship" Club Planes, and 14-berth "Flagship" Skysleepers.

Congratulations to you, Mr. Ingalls, and to your able assistants, L. W. Putney and Paul O'Neal, and all other members of your efficient, smooth functioning organization.

"Fly With Wright the World Over"

WRIGHT
AERONAUTICAL CORPORATION
PATERSON NEW JERSEY

A DIVISION OF CURTISS-WRIGHT CORPORATION

Guides to Operating Efficiency at AMERICAN AIRLINES

FORMICA control pulleys and fairlead bushings may be little things . . . but their unfailing performance and lightness contributed a share to American Airlines' winning of the coveted Aviation Magazine Maintenance Award.

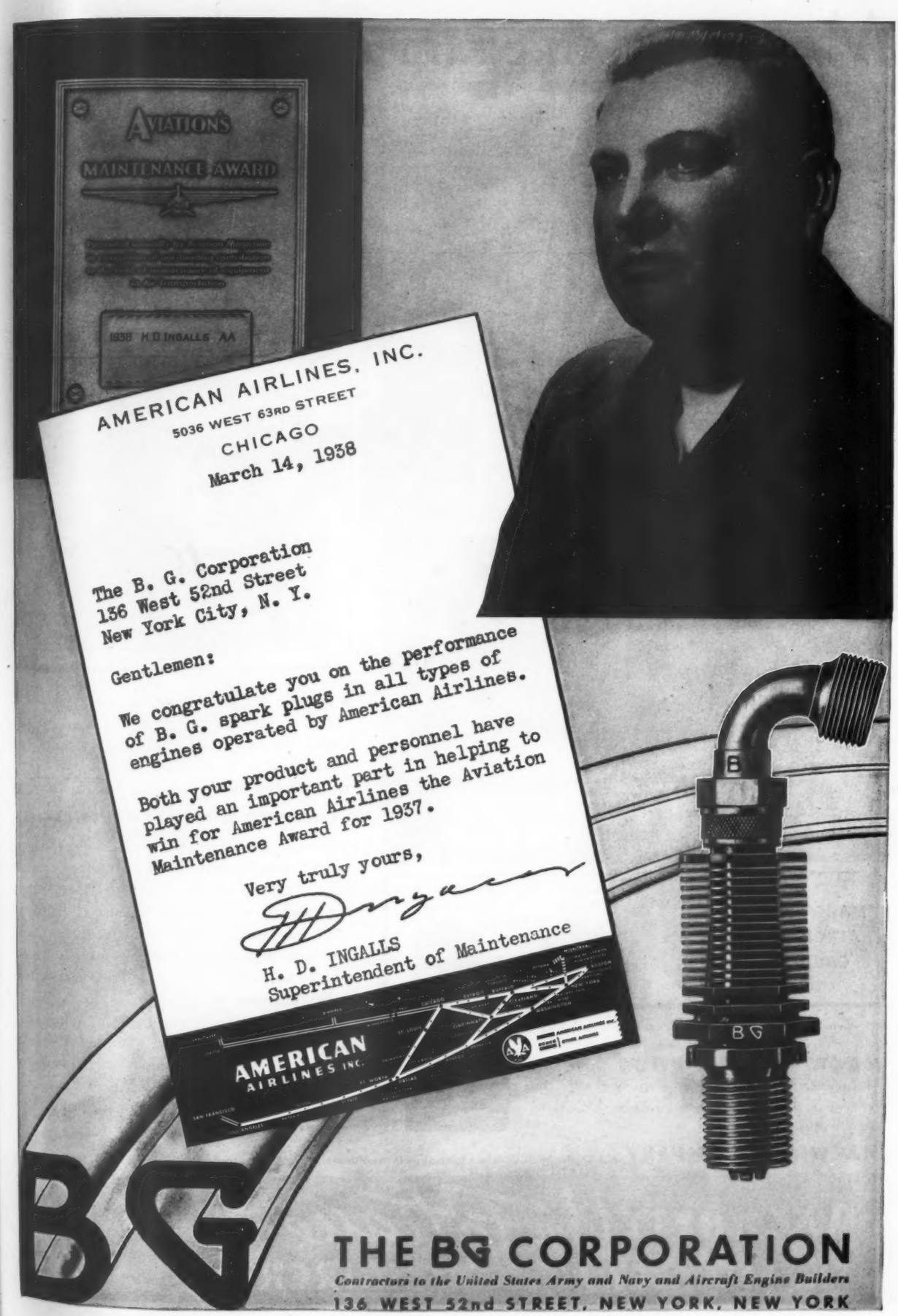
Nearly every American Airlines ship is equipped with these products when delivered. Naturally, during routine replacements, their past performance makes Formica the only choice.

FORMICA

These pulleys weigh about half as much as those made of lightest metal. Constant checking under Army and Navy specifications assures uniform quality.

The FORMICA INSULATION *Company*

4628 Spring Grove Ave. *Cincinnati, Ohio*


AVIATION'S
MAINTENANCE AWARD
1938 H.D. INGALLS AA
AMERICAN AIRLINES, INC.
5036 WEST 63RD STREET
CHICAGO
March 14, 1938
The B. G. Corporation
136 West 52nd Street
New York City, N. Y.
Gentlemen:
We congratulate you on the performance of B. G. spark plugs in all types of engines operated by American Airlines.
Both your product and personnel have played an important part in helping to win for American Airlines the Aviation Maintenance Award for 1937.
Very truly yours,
H. D. INGALLS
Superintendent of Maintenance
AMERICAN
AIRLINES INC.
B
BG
BG
THE BG CORPORATION
Contractors to the United States Army and Navy and Aircraft Engine Builders
136 WEST 52nd STREET, NEW YORK, NEW YORK

MACWHYTE AIRCRAFT CABLES HELP WIN

MAINTENANCE AWARD ... FOR AMERICAN AIRLINES' "DICK" INGALLS

H. D. Ingalls, Supt. of Maintenance for American Airlines, Inc., who was recently presented with AVIATION'S ACHIEVEMENT AWARD "in recognition of outstanding contribution to the field of maintenance of equipment in Air Transportation."

● Proud of the maintenance record established by "Dick" Ingalls during 1937 is American Airlines! Under his supervision American Airliners were conditioned to fly 50,000 plane miles per day... with extreme safety, and clock-like regularity!

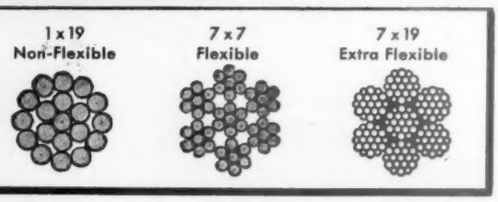
EQUIPPED WITH MACWHYTE CABLES

Macwhyte Company, too, is proud of the "maintenance" part it has played in the daily flying life of this great American Airfleet. All American Airliners are equipped with Macwhyte Aircraft Cables.

These precision-made Macwhyte Cables, famous for their high-fatigue resisting qualities, are depended on every day to guide the course of these giant American Airliners.

Today on planes of every size and kind, both at home and abroad, you'll find Macwhyte Hi-Fatigue Cables and Tie Rods ... a testimonial to the quality of equipment made by Macwhyte, specialists in the manufacture of Cable, Tie Rods, and Braided Rope Slings for aircraft.

MACWHYTE AIRCRAFT CABLES



Macwhyte Hi-Fatigue Aircraft Cable is available in both PREformed and non-preformed —tinned, galvanized or stainless steel.

MACWHYTE TIE RODS

MacwhyteTie Rods like Macwhyte Aircraft Cables conform to all A-N specifications.

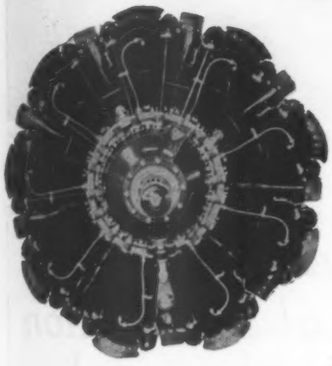
Streamline ■ Square ● Round

MACWHYTE COMPANY KENOSHA, WISCONSIN • Specialists in the Manufacture of Cable, Tie Rods and Braided Rope Slings for aircraft

MACWHYTE Hi-Fatigue TRADE MARK AIRCRAFT CABLES

ORCHIDS TO AMERICAN AIRLINES

and to BREEZE



BREEZE MARK *Shielding*

Regular Contractors to the U. S. Government

AIRCRAFT PRODUCTS

Radio Ignition Shielding Assemblies (including Spark Plug Shielding)
Flexible Conduit and Fittings
Junction Boxes
Flexible Shaft and Case Assemblies for Remote Control, Tachometer Drives, Fuel Pump Drives, etc.
Aeroflex Flexible Gas and Oil Lines
Internal Tie Rods
Ammunition Rounds Counters
Radio Tuning Units
Propeller Pitch Controls
Generator and Ignition Filters
Elevator and Rudder Tab Controls
Flexible Tubing of Stainless Steel, Aluminum, etc.
Exhaust Gas Analyzers
Fuel and Oil Tanks
Engine Cartridge Starters
Spark Plugs (shielded and unshielded)
Multiple Engine Ignition Switches
Hydraulic Engine Controls

STAINLESS STEEL DIVISION

Pioneers in the design and development of stainless steel structures and stainless steel fabricated products.

AVIATION'S Maintenance Award for 1937 goes to American Airlines. As supplier of radio and ignition shielding to American Airlines, BREEZE is proud to contribute to the maintenance record which won this award. American Airlines specified BREEZE Shielding because of its efficient action, ease of maintenance, and long life—all 'round top performance.

BREEZE products can "do a job" for you. A glance at our list of products will show that we offer the most varied and complete line of quality aircraft products available.

BREEZE CORPORATIONS, INC.

41 SOUTH SIXTH STREET NEWARK, N. J.

"After Extensive Tests of Several Types of Floor Cleaners, we use Magnus Cement Cleaner 100% in American Airline Shops."*

H. D. INGALLS,
Supt. of Maintenance

Magnus Chemical Company congratulates Mr. Ingalls upon receiving the Aviation Maintenance Award. Naturally, we are proud that he uses MAGNUS CEMENT CLEANER 100% in all American Airline Shops.

We believe that it is because he has found, as you would find, that MAGNUS CEMENT CLEANER *cleans, whitens* and *hardens* cement, prevents decomposition and eliminates dusting. Magnus-cleaned runways and floors have big eye-appeal to patrons, and minimize accident hazards caused by greasy, oily, slippery floors.

For thorough cleaning of aluminum and steel motor parts, MAGNUS AVIATION CLEANER cleans quickly and safely, with great savings in time. For complete removal of oil, burnt-in exhaust carbon, traffic film and stains from wings and fuselages, MAGNUS AVOCLEAN is harmless to surfaces and workers alike. It leaves a dust-proof, polished gloss that actually increases speed and saves fuel through decreased wind-resistance.

Send to our Technical Department for a wealth of FREE information on cleaning operations in the manufacture and maintenance of aircraft.

MAGNUS CHEMICAL COMPANY
221 SOUTH AVENUE GARWOOD, N. J.
** From original letter on file in our Office.*

MAGNUS CLEANERS

Magnus Cement Cleaner used in operations hangar

Engine build-up department cleaned with Magnus Cement Cleaner

Engine overhaul department, cleaned with Magnus Cement Cleaner

HASKELITE Congratulates

★ ★ ★

H. D. INGALLS
Superintendent of Maintenance for American Airlines Inc.

★ ★ ★

. . . on winning the award as "THE OUTSTANDING MAN IN MAINTENANCE WORK DURING 1937, sponsored by the Air Transport Association of America. We point with pride to the fact that Mr. Ingalls is a consistent user of Haskelite Aircraft Products . . . prima facie evidence that these products measure up to the most exacting specifications of air transport service.

HASKELITE
HASKELITE MANUFACTURING CORP.
208 W. Washington St., Chicago, Ill.
Offices in Detroit, New York, Los Angeles

For dependable results in electrical installation and maintenance work...

PUT IT UP TO CRESCENT

Crescent electrical contracting engineers are experts and have had a wide experience in transport work, having serviced shops under Dick Ingalls' supervision for more than 13 years.

We have serviced the American Airlines' Chicago shops since Mr. Ingalls has been identified with that company.

We take pleasure in congratulating Mr. Ingalls on winning the Aviation Maintenance Award for 1938.

Write us for information regarding the electrical installation and servicing of your shop.

Mr. H. D. Ingalls, Superintendant of Maintenance for American Airlines, winner of Aviation's Maintenance Award for 1938.

CRESCENT ENGINEERING CO.
Electrical Contracting Engineers
General Office: 1109 So. State Street, Chicago, Illinois
Clearing Branch: 5321 W. 65th Street, Chicago, Illinois

WE CAN HANDLE YOUR

RADIO REQUIREMENTS!

and deliver

ANYWHERE

ANYTIME . . . .

. . . ON TIME

Everything in radio equipment for amateur, experimenter, and repairman

Newark is known for its complete stock of radio equipment and its ability to take care of the most exacting requirements. We are justly proud of the fact that we were selected to supply American Airlines with its ground receivers, replacement of all tubes for receivers and transmitters, and all repair parts in all equipment. Selection of Newark by Mr. Ingalls for American Airlines' radio requirements is significant and proves our ability to supply the right equipment—at the right time—in the right place. Our free catalog is ready for you—write for it!

We want to add our congratulations to that of the entire aviation industry to H. D. Ingalls, Superintendent of Maintenance for American Airlines on receiving the 1937 Aviation award for his outstanding work in maintenance.

★ ***Distributors for:***

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RCA De Forest
RCA Victor
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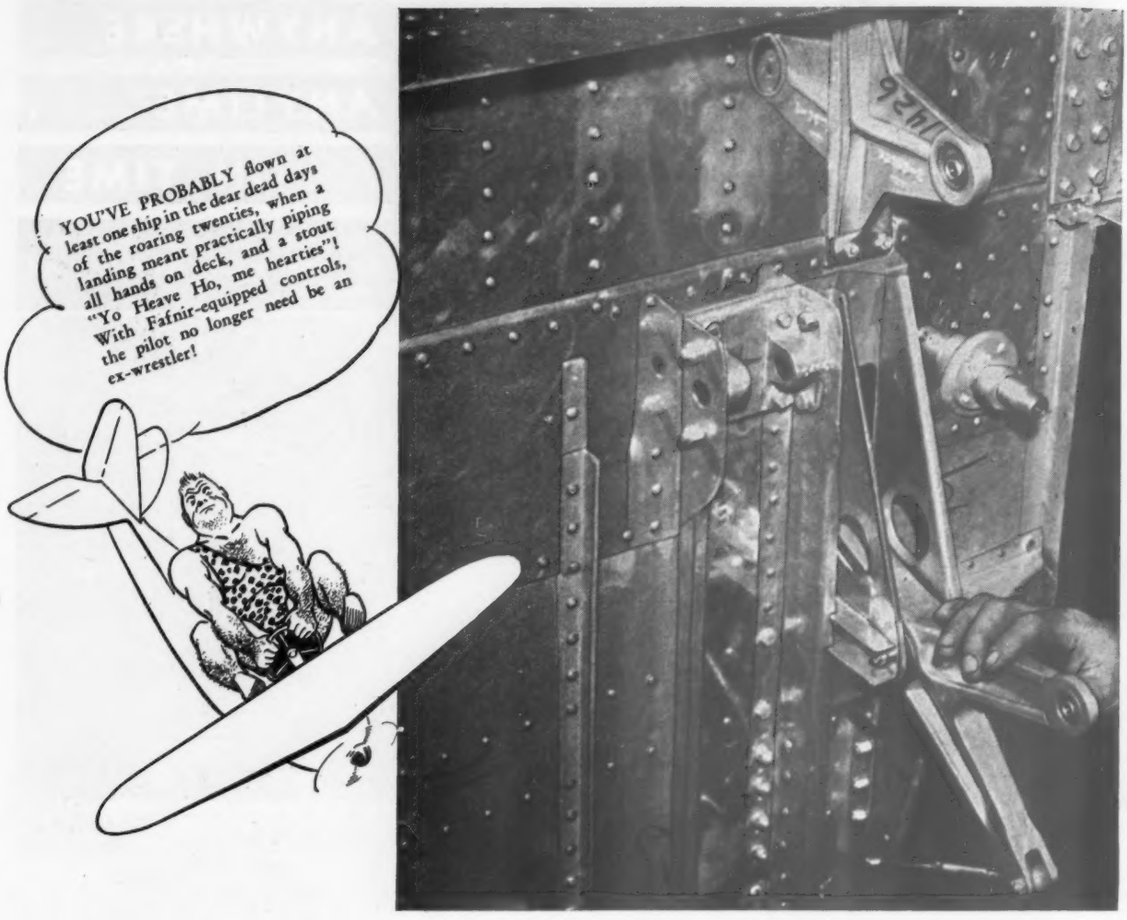

YOU'VE PROBABLY flown at least one ship in the dear dead days of the roaring twenties, when a landing meant practically piping all hands on deck, and a stout "Yo Heave Ho, me hearties"! With Fafnir-equipped controls, the pilot no longer need be an ex-wrestler!

Elevator Control Bell-Cranks and Center Elevator Hinge—Fafnir-Equipped.
Photo courtesy Lockheed Aircraft Corp., showing Lockheed 14.

"STIFF-JOINTED FLIPPERS"

Went out with the Baling-Wire Age!

A toast to the passing of the "baling-wire age"—to "Jennies" struggling manfully for fence-clearing altitudes—to centre-section radiators—and *"stiff-jointed flippers"*!

And a word to manufacturers who may yet be building a touch of arthritis into elevator hinges and controls—there's a quick, easy remedy for it to-day!

Fafnir Ball Bearings, especially designed for their jobs, eliminate binding from elevator hinges, bell-cranks and controls. Keep the entire system tight, yet sensitive to the slightest forward or backward motion of the control.

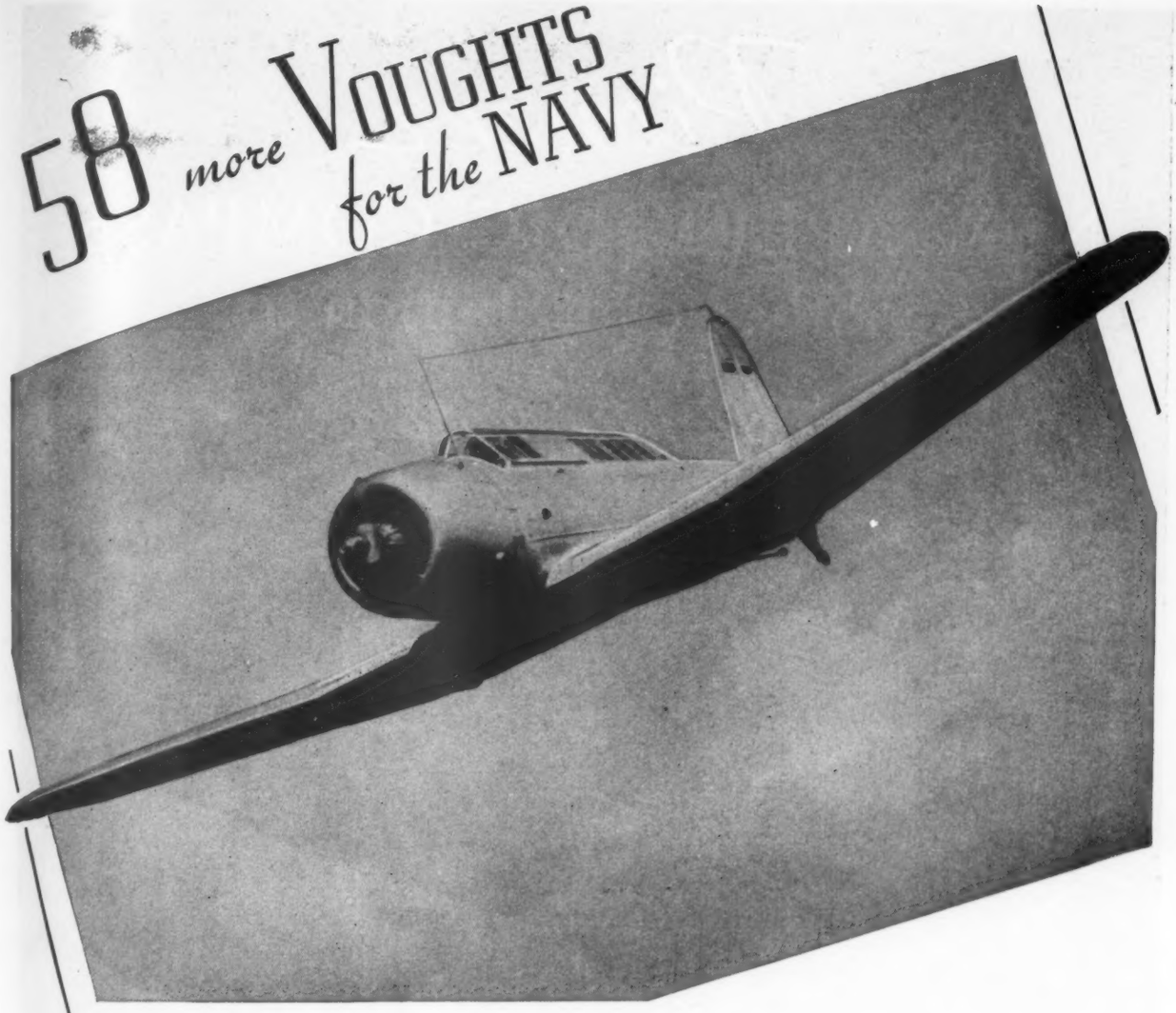
There are countless places in every airplane where ball bearings can make flying easier, more positive, safer! And there's a Fafnir built for every one of them — lubricated and sealed for service. Write for the Aircraft Catalog. The Fafnir Bearing Company, Aircraft Division, New Britain, Conn.

"The Aircraft Bearing Specialists"

FAFNIR BALL BEARINGS

THE BALANCED LINE—MOST COMPLETE IN AMERICA

58 more VOUGHTS for the NAVY



The performance of the Vought SB2U-1 has been so satisfactory that a repeat order for 58 additional airplanes, officially designated as the SB2U-2, was recently awarded by the United States Navy . . . Again Chance Vought demonstrates the thoroughness of its twenty-one year experience in producing outstanding aircraft for service with the fleet.

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NEW APERIODIC COMPASS

another contribution to

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Leading airline experts who have tested and accepted this compass agree that it represents a distinct advance in air navigation. It has no parallax error; the card is exceptionally steady and northerly turning error has been practically eliminated. Indirect electric illumination without glare, a positive setting and locking device and universal compensator have been provided.

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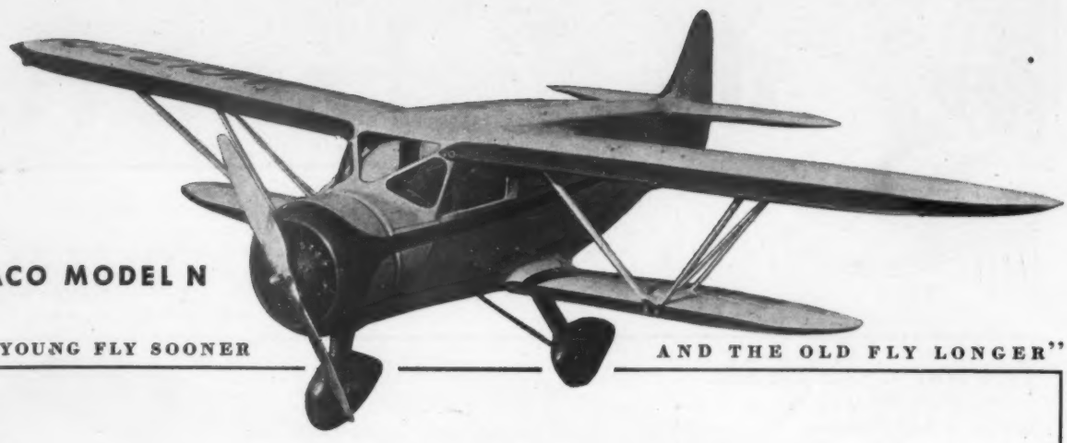

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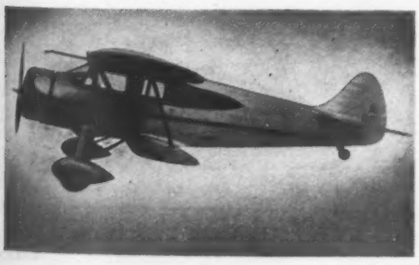
"LETS THE YOUNG FLY SOONER AND THE OLD FLY LONGER"

SAFETY...

WITHOUT COMPROMISING PERFORMANCE

● Designed primarily as the *safest sedan-type airplane* for novice or veteran pilot, the three-wheeled Waco N forfeits none of the speed and comfort that are traditional Waco characteristics. At altitude, it cruises at 148 miles an hour . . . yet its unique design permits safe landings in clearings far too small to accommodate even much lighter ships. Ground-loop and nose-over are impossible. And because of its level flight position when on the ground, all-around visibility is perfect at all times. See your local dealer, or write direct for complete information. *Terms are available on all models.*

THE WACO AIRCRAFT COMPANY, TROY, OHIO



1938 MODEL C CABIN— Beautifully finished . . . faster . . . for 4 or 5 persons and luggage . . . also available as freighter.

1938 MODEL S CABIN— Sedan-type 4- or 5-place . . . greatest airplane passenger-mile value on the market.

SAFETY TO THE 'NTH DEGREE • LUXURIOUS COMFORT • OUTSTANDING PERFORMANCE

WACO AIRPLANES

"ASK ANY PILOT"

WACO LEADS IN AIRCRAFT REGISTRATION

The Birdmen's Perch

Frankly, it's puzzled us quite a bit the way everybody and his uncle has taken to the little brain-teasers we've been slipping into the Perch recently. One of these fine days we're going to pull a "fast one," and publish the Grand-Daddy of all Puzzledom. So simple that your best friend wouldn't tell you—yet it's never been solved! Till then, yrs. very truly, MAJOR AL WILLIAMS, alias "Tattered Wing-Tips," Mgr., Gulf Aviation Dept., Gulf Aviation Products, Gulf Bldg., Pittsburgh, Pa.

ANYWAY, IT KILLS THE BIRD

Dear Major Williams: In answer to the question of what happens when a bird flies into the propeller of a plane. It will kill the bird . . . cause the propeller to go to bits and will no doubt tear the engine from its mounting.

—Vincent Lynch, Niles, Ohio

Dear Sir: In questioning what happens when prop meets bird. I saw such an incident at Floyd Bennett when a Daily News Plane met up with a pigeon.

The result was that the bird was cut in two, as though with a butcher-knife. The bird lost very little blood . . . and on inspecting the prop, I could not find a speck of blood, feathers or sign of impact. There were three eye-witnesses.

—N. R. Giancarlo, Sixth Battalion, U. S. N. R.

OUCH!

Dear T. W-T: I am a twelve-year-old girl. My father is a transport pilot and he has promised to teach me to fly.

In the December issue I read about the flyer who passed the balloon and then went back for another look. It asked for wind velocity. Please send me the answer. Besides I wonder what business he had flying without instruments.

—Frances Sherman

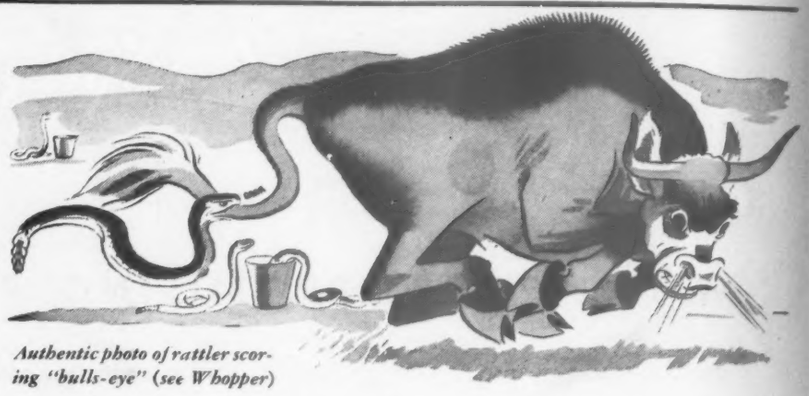
PROPOSAL

We propose Gulfpride Oil for use in the finest planes, for this very simple reason:

Gulfpride Oil is refined by Gulf's famous Alchlor Process. This process takes 100 percent Pennsylvania oil, *already* refined by ordinary methods, and proceeds to yank out as much as 20% *more* sticky sludge and waste. Result—Gulfpride—"The World's Finest!"

AS OTHERS SEE OUR PUZZLERS

"Professor, that wasn't cricket"—A. G. Becker, Pres., Pittsburg Inst. of Aeronautics



Authentic photo of rattler scoring "bulls-eye" (see Whopper)

. . . "H.O.T.F.M.A. (Home of the Feeble-Minded Aviators)" — 'Speed' Ericson, Jr. . . . "As crazy as a bed-bug, as nutty as a fruit-cake"—Sam Stites . . . "No soap"—Harry Watson . . . "I agree with you"— Walter Hoffman..."I don't think you'd pull one like that"—John Bell, South Carolina . . . "I knew there was a catch"—Jesse F. Bell, W. Va. . . . "Vaccinated with a phoney-graft needle"—Cecil Knight . . . "You're Nerts" — Hen Shepler . . . "Who turned off the wind?" — Clif Durling . . . "Friends are scratching bald heads"—Ralph Walker..."Screwy" — GeorgeSouth..."Don't weaken"—Jerry Hoffer . . . "You got me figuring"—John Potts . . . "So fooey on your 100 m.p.h. stuff which only confuses a guy"—Rev. C.E. Frazier..."Plenty vague"—R.Westmoreland . . . "Racking my brain for two seconds" —C. Meshberger . . . "Why should a man in his right mind . . . ?" — Andy Rose . . . "It was three pilots who left Bradford, Pa. for Philadelphia, and landed in N. Y."—Rosemary Brewster, Helen McBride, Lee Jenkins . . . "Why don't somebody tell me these things"—E. McDivitt..."They pep you up just like that Good Gulf Gas."Charles Kurleman. (*That's right, Charlie!*)

THIS MONTH'S WHOPPER

Dear Al: Any fledgling who doesn't get the Bughouse Navigation Problems should be recommended for loss of his navigator's license at once.

P. S.—You know, we had to quit using Gulf Aviation Gasoline set out in bowls to kill grass-hoppers out here, because all the rattlesnakes started to score bull-eyes, striking from twenty to thirty feet.

You see, after drinking it, they thought they were rockets, and would just straighten out toward an enemy and let the good old Gulf Aviation Gas power surge just *blast* them on their way!

—Capt. J. C. Adams, Fort Lincoln, N. D.

APOLOGIES!

We said that the "only" way a plane could get back to its starting point (Feb. Problem) was by starting at the south pole. Our face is reddened by Messrs. F. Windsor, J. Rodenhausen, R. Crean, P. Sykora and W. Roycraft, to wit: The plane may start 115.915 miles from the *north* pole, too. Thanks!

It may also start from an aircraft carrier—K. L. Beck, W. Doymon, R. Ross, R. B., H. B., and L. J. "It's the curvature of the earth"—E. Nelson. "The earth rotated west to east"—A. Niewenhoff. Also from on top of a coupé...Oh, well...

Try this! Three planes start off at the same time, two of them in pursuit of the third, and both 100 miles behind it. One of the pursuing planes has exactly the same speed as its quarry, so never closes in. The other, however, catches up with it—Bingo!—shoots it down, and returns to join its mate. They meet at exactly over the spot their quarry started. How far did the unfortunate plane travel before being brought down?—(Idea thanx to Blake Henderson)—Drop T.W-T. a line for the answer!

Gulf Oil Corporation and Gulf Refining Company . . . makers of

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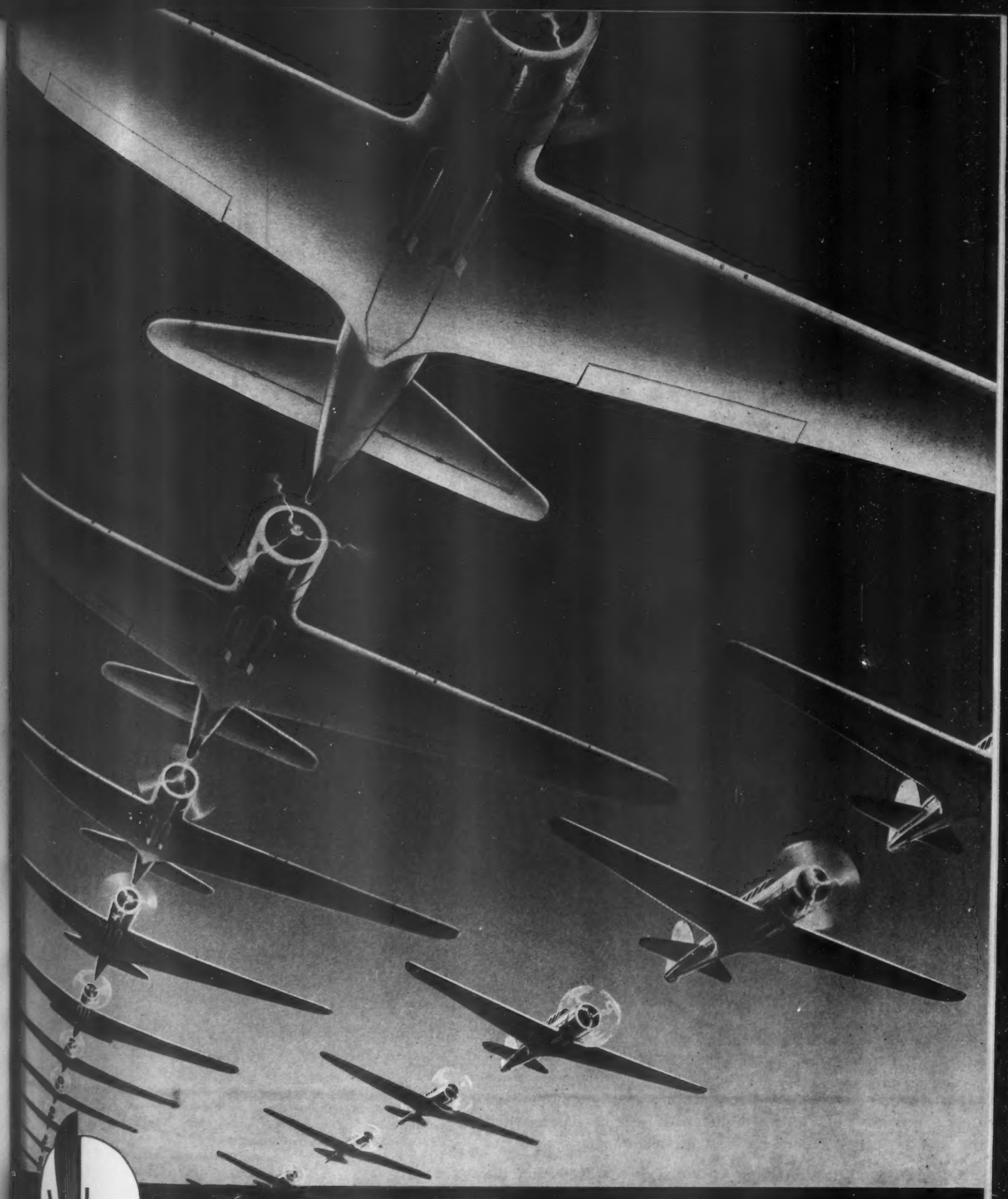

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There is no greater national security than an adequate fleet of Vultee Long Range Attack Bombers. Mounting six machine guns and carrying up to 2000 lbs. of bombs, the Vultee VII-GB has a high speed of 236 m.p.h. and a cruising range of 2700 miles. Its performance is comparable, if not superior to multi-engined bombers; unit cost and maintenance are far less. Thus, the economic and military advantage of a fleet of Vultees compared to a few big bombers is obvious. VULTEE AIRCRAFT [Div. of Aviation Mfg. Corp.] Downey, Los Angeles County, Calif.

MEN *"in the know"*

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"It gives me assurance under the severest strains"

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Roebling Wire Aircraft Products are made in Stainless Steel and High Carbon (Tinned or Galvanized) Steel. They include: Aircraft Wire; Aircraft Strand; Aircraft Cord (6 x 7, 7 x 7, 7 x 19); Ferrules and Thimbles; Serving and Locking Wires; Control Strand and Casing; Compressed Fittings for Attachments; Power and Lighting Cable; Welding Wire.

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Inquiries solicited from plane owners, potential "flyers" and distributors.

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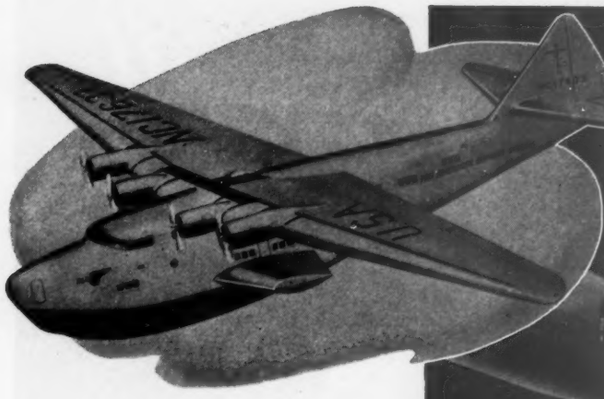

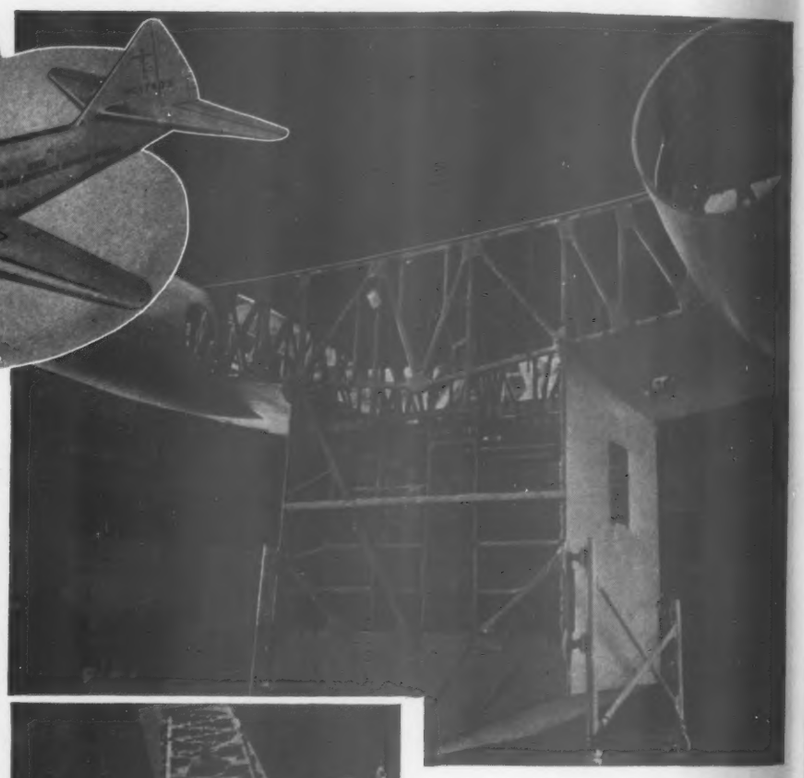

CENTRAL PORTION *of the first new "Clipper," showing extensive use of* SHELBY *Seamless Aircraft Tubing. This section of the hull will house the dining salon, with cargo space above. Engine nacelles stand 25 feet above assembly floor.*

CENTRAL WING SPAR *under construction. Workmen appreciate the dimensional accuracy and uniform properties of* SHELBY *Seamless. There is no finer tubing for aircraft construction.*

THE story of the new Pan American Clippers, now under construction by Boeing, is a story of superlatives. For these six giants of the airways will far transcend in magnitude anything that has heretofore been attempted in heavier-than-air craft.

Spreading 152 feet from tip to tip, these ships, the first four-engined transports, will carry gross weight up to 82,500 pounds. Their speed will range up to 200 mph., and cruising radius will approach 5000 miles. They will provide luxurious accommodations for 72 daytime passengers, or upper and lower berths for 40 passengers at night.

Naturally, for craft of such record-breaking proportions, Boeing engineers could follow no precedent. In every stage of development they had to establish their own standards. SHELBY Seamless won its place in the hull, wing spars, and cross members.

SHELBY Seamless Aircraft Tubing, long a standard with leading aircraft builders, has hung up an enviable record. Its consistent quality, its high strength-weight ratio, and its adaptability to all modern fabrication methods were important factors in the adoption of the all-metal framework. Add to this the fact that it can be obtained in various shapes, wall thicknesses, and grades of steel—exactly as you need it—and you have the tubing that helps make aircraft construction a more exact science — SHELBY Seamless.*

*Round Tubing is also available in SHELBY "BF" Aircraft Tubing, which has an improved bright outside finish.

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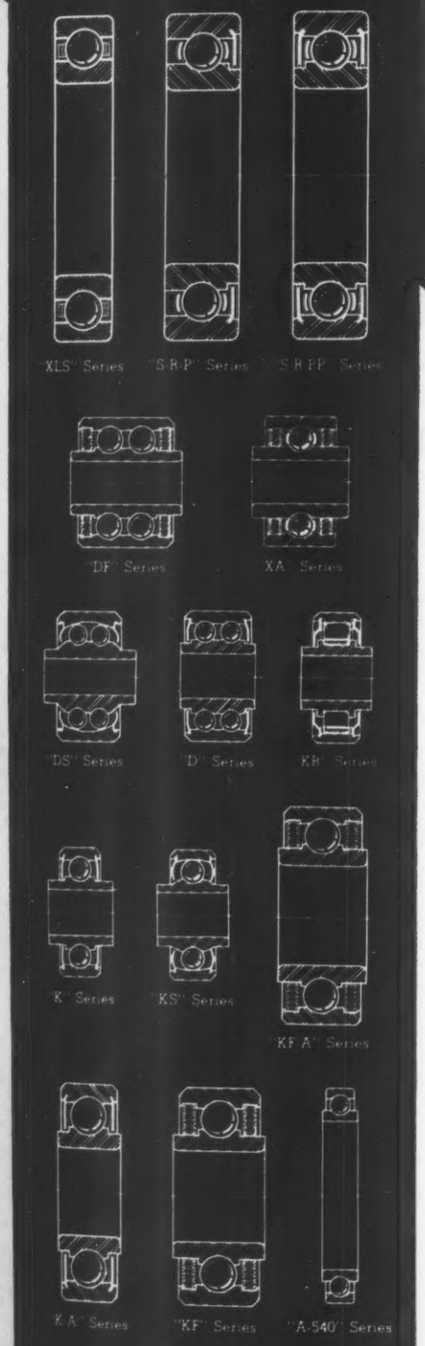

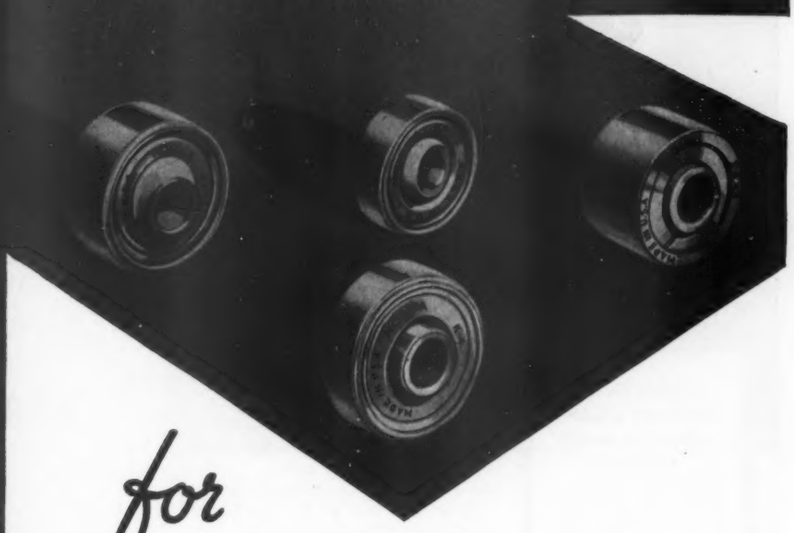

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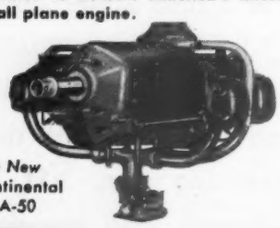

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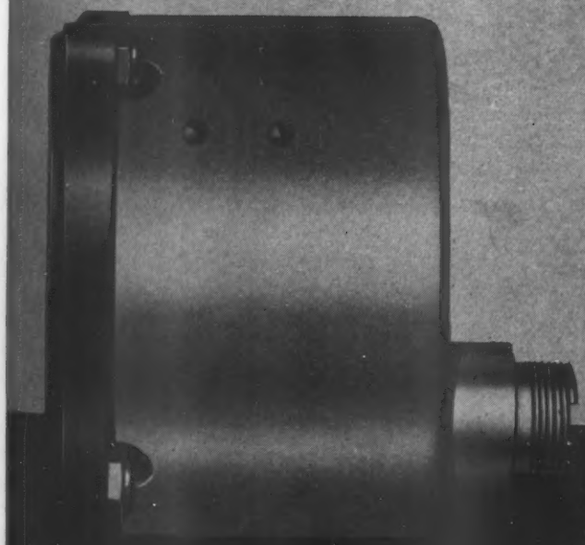

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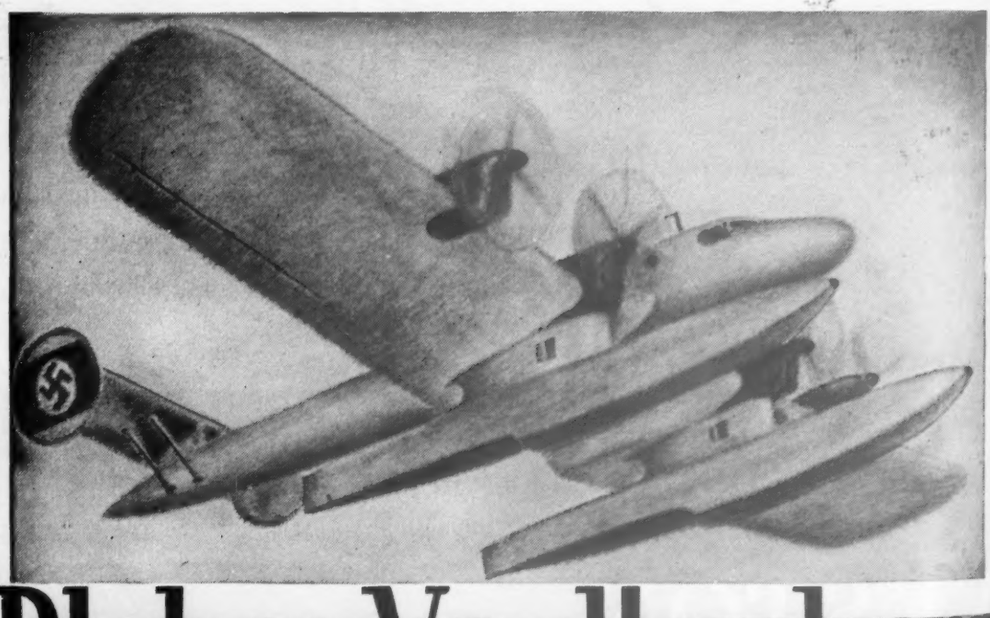

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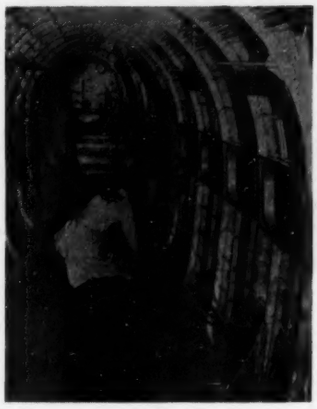

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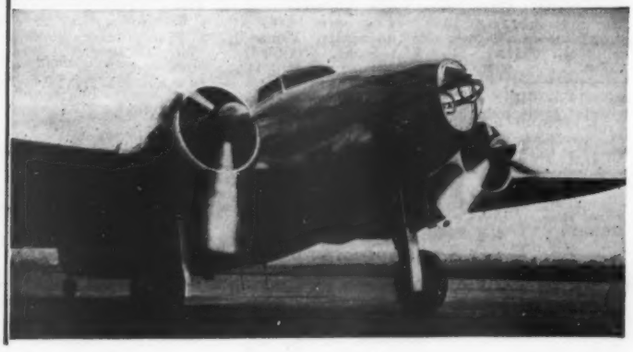

Classified Advertising

10 CENTS A WORD — $2.00 MINIMUM

EAGLEROCK OX5 licensed to August 1938. Very good condition. Price $225. Natrona Heights Airport, Natrona Heights, Pa. No. 1

RYAN B-5 for sale or trade. Licensed until last of August. General condition excellent. 40 hours since major on J-6-9. Want four place cabin. Preferably Waco or C-37 Cessna. Mileski Flying Service, Worland, Wyoming. No. 2

MONOCOUPE, 125 Warner, 400 hours, shielded, all instruments and hood, pants. Price reduced to $1475. Harry L. Moehlman, Court House, Elyria, Ohio. No. 3

J5 WACO, straightwing with Bendix brakes and Standard steel propellor; also many spare engine parts, including a Heywood starter. Licensed to June 15th. Dandy ship for sign towing. Bargain at $800. Martin Devereaux, 356 Beach 13th Street, Far Rockaway, New York. No. 4

CRACKED MILLERIZED OX5 American Eagle sell as is for $75.00. 4 General tires, 700x4 Cub motor mount. 1429 Nobles Lane, Pittsburgh, Pa. No. 5

90 HP DELUXE REARWIN in new condition. No time on motor since complete factory overhaul. Only 141 hours on ship. No trades but will finance. $2350. Box No. 330, Indiana, Pa. No. 6

LAIRD, three place. Licensed to June, 1938. 220 J5 Wright, motor overhauled. Instruments in both cockpits. For quick sale $900.00. Billy Stone, Grand Theatre, S. Adams Street, Peoria, Ill. No. 7

OX5 AMERICAN EAGLE. Licensed to October. Completely millerized motor. No time since licensed. Fabric and appearance good. $350 buys this ship. L. E. Schroeder, 4551 Ray, St. Louis, Mo. No. 8

REARWIN SPORTSTER; 85 HP. Engine time 191 total, brakes, stearable tail wheel, plane time 1081 hours, navigation lights, standard instruments. Licensed till March 1939. Price $1,600.00. Monarch Air Service, Municipal Airport, Chicago, Ill. No. 9

ARROW SPORT: Powered by Ford V-8; total time 20 hours. Curtiss Wright Sedan; Powered by J67E—Generator—Electric Starter—Full night flying equipment—Excellent airplane for all types of aerial photography. The above airplanes can be financed. Safair, Inc. Hangar B, Roosevelt Field, Mineola, N. Y. No. 10

ARROW V-8 Gull-Wing less than 20 hours, brakes, tailwheel, lights, starter, compass, modernized water pump, large crankcase. Licensed February 1939. Cost over $1850, prices for quick cash sale, no trades. Housatonic Air Service, 1738 Elm Street, Stratford, Conn. No. 11

CURTISS JR. Prices for quick sale, completely recovered, and engine recently overhauled. Sacrifice, $375.00 Cash. Licensed until October 1938. Miller Aero Service, Route 1021, Pgh (10), Pa. No. 12

PORTERFIELD—built December 21, 1934, LeBlond 70 h.p. 302 hours, good condition, speed ring. Only $850.00. The H. C. Robbins Company, Cleveland Airport, Cleveland, Ohio. No. 12A

1936 AERONCA—Licensed to June 1938; 180 hours total time. Privately owned. Ship and engine in excellent condition, always hangared. Must sell at once. Any reasonable offer considered. William Thornbrough, Fowler, Indiana. No. 13

"Classified" INDEX

April, 1938

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HISSO EAGLEROCK A-3 Wheel brakes 50 hours on engine since major, no time on ship since complete overhaul $550.00. Will take late model car or pick up truck part payment. Philip C. Pederson, Box 514, Elbow Lake, Minnesota. No. 14

VELIE MONOPREP Licensed, rebuilt throughout. New covers, orange and blue high luster finish, dual controls. $475.00. Also seat pack, like new, $65.00. Central Airways, Burlington, Iowa. No. 15

VELIE-KARI-KEEN, new motor. Licensed. Excellent condition. Bargain. R. A. Swenson, Box 921, Williston, No. Dak. No. 16

CUSTOM WACO, 1934, Jacobs just modernized at cost of $750, hand rubbed, pants, lights, flares, turn and bank, climb, receiver, generator, starter, instrument hood, excellent condition, deliver anywhere, make offer. J. T. Moore, Jr., Box 893, Reading, Pa. No. 17

WACO 1936 Custom cabin. Lights, flares, bank and turn, climb, clock, radio, pants, steel prop, large tanks; 5-place; Insignia blue with cream trim. 225 Jacobs; 1 year old. 160 hours. Never scratched; priced to sell, cannot be told from new ship. Dixie Airways, Inc., Shushan Airport, New Orleans, La. No. 18

1935 AERONCA, damaged $350; J5-Scinson $650; Heath $77.50; Aeroncas $350 up; Aeronca motor $65; OX-ships $125 up. 100 other bargains. Send 25c for big Winter Directory. Used Aircraft Directory, Athens, Ohio No. 19

FREE AEROPLANE with motor purchase. Easy terms, $12.50 down. 200 pounds useful load. Welded steel construction. Propeller—all types—98c up. Sensational values. Illustrated information, and flying manual. 25c. Universal Aircraft, Fort Worth, Texas. No. 20

J65 STINSON SM1, airwheels fuselage needs recovering. Also will trade 1930 Cord convertible sedan for J5 motor. Other SM1 parts for sale. John Paul Jones, 8 Jefferson S.E., Grand Rapids, Michigan. No. 21

1935 AERONCA, damaged $350; J5-Scinson $650; Heath $77.50; Aeroncas $350 up; Aeronca motor $65; OX-ships $125 up. 100 other bargains. Send 25c for big Winter Directory. Used Aircraft Directory, Athens, Ohio. No. 22

1935 DOUGLAS-DOLPHIN, Model 8-114, powered with two SC Wasp 10:1 blowers having had 75 and 109 hours, respectively, since overhaul. Total airplane time 739 hours. Airplane recently painted and in good flying condition. Passenger capacity five, crew two. Special equipment: Sperry Directional Gyro, Artificial Horizon, Kollsman Sensitive Altimeter, Kollsman Aperiodic Compass, RCA Radio Receiver and Transmitter. Airplane at Esso Hangar, Newark Metropolitan Airport, Newark, New Jersey. For information contact Aviation Department, Standard Oil Development Company, 26 Broadway, New York City. No. 23

CUB, J3, Sport-Demonstrator, practically new. Cub, J2 Demonstrator. Little time, like new in every respect, many extras. Trade and finance. Clarksburg Flying Service, Clarksburg, W. Va. No. 24

PORTERFIELD ZEPHER, 75 hours total, $1095; $100 extras; trade late model car, finance balance. Virgil Davis, Cadillac Co., Wilmington, Del. No. 25

STINSON S, 1931; 4 place cabin, Lycoming 215 h.p. Extras include retractable landing lights, mud guards, electric starter. Good condition. Price now is only $1,375.00. The H. C. Bobbins Company, Cleveland Airport, Cleveland, Ohio. No. 26

CLASSIFIED ADVERTISING

10 CENTS A WORD — $2.00 MINIMUM

LOENING COMMUTER: Completely overhauled, new covering, refinished, Hull tight, perfect throughout. Trades considered. Aeroways, Inc., Cleveland Airport, Cleveland Ohio. No. 27

CURTIS JR.—Salmson powered, plane and engine completely overhauled, same as used by Mr. Hyde for coyote hunting, story in February issue of Western Flying. Meinke-Eldred Flying Service, Lost Nation Airport, Willoughby, Ohio. No. 28

STINSON TRIMOTOR U and T parts; Pilgrim parts; Hamilton Standard adjustable propellers and Magnetoes; Carburetors; Ignition switches; J5 Lycoming and Wasp B cylinders. General Airmotive Corporation, Municipal Airport, Cleveland, Ohio. No. 29

CUB 1935—Motor just majored, entire ship refinished, new tires, equivalent to a new ship. $695.00. Skyways, Inc., Cleveland Municipal Airport, Cleveland, Ohio. No. 30

RYAN—B5-J-9 Motor just completely majored at cost of $700. Wing now being recovered. Plane completely fitted for aerial mapping. Sale price with motor $1500. Less motor $900. Now located Augusta, Georgia. Standard Aerial Surveys, Hackensack, N. J. No. 31

1936 STINSON RELIANT, two way radio, Smith Prop, special paint and upholstery, never cracked, a real buy. Baker Oil Tools, Inc., Box 71, Huntington Park, Calif. No. 32

WACO CABIN, 1937; 5 place S-7, Jacobs 225 h.p. Extras include flares, arm rests, landing lights, bank and turn, rate of climb, RCA receiver, cabin heater, eleectric gas gauge, prop. spinner, compass light. Only 43 hours total time. Perfect condition throughout. Only $4,950. Write for details. The H. C. Robbins Company, Cleveland Airport, Cleveland, Ohio. No. 33

CUB 1937 Seaplane completely metalized. Dual ignition, 200 hours. For sale bargain. S. Morgan Barber, Greens Farms, Connecticut. No. 34

ARROW-SPORT, LeBlond excellent condition $500.00. Will trade for 2 or 4 place cabin and pay difference. John Herfurtner, 3090 Park Avenue, New York City. No. 35

DELUXE AERONCA SEAPLANE. Extra special $1250. Also DeLuxe LeBlonde 70 Porterfield. Has everything. Like new. $1250. Fred D. Cook, 11 Revere Dr. E., Floral Park, New York. No. 36

SLIGHTLY used 1938 Cub Sport demonstrators at reduced prices. Late model Cubs $650 up. Fairchild 21—$995. Pitcairn PA6—$795. Pitcairn PA7S—$1200. Rearwin 70—$1195. Eaglets, Travelaires and Wacos. Many others. Write for list. Bennett Air Service, Hightstown, N. J. No. 37

FAIRCHILD 1934, C7E, Warner Series "40"—125 H.P. engine, air starter, Hamilton prop., wheel pants. No time on ship and engine since overhaul. Loening yellow with black trim, high gloss finish. Priced reasonable. State Trade School, Putnam, Conn. No. 38

LOW WING AERONCA, Warner, Demonstrator, 490 hours total, just majored, regular instruments, navigation lights, Exide battery, flat and Lear radio. $1925, perfect condition. Aircraft Service, Municipal Airport, Cleveland, Ohio. No. 39

MONOCOUPE—125 Warner, motor just majored, plane in perfect condition. $1375.00. Cub—1936—motor just majored, ship A-1 condition. Price $825.00. Taylorcraft built August 1937—80 hours—privately owned. We have on hand at all times used Taylorcraft. Write us for your needs. Taylorcraft Distributors for Eastern Ohio, Meinke Eldred Flying Service, Lost Nation Airport, Willoughby, Ohio. No. 40

1936 PORTERFIELD: Brakes, speedring. Excellent condition. Licensed to March, 1939. 110 hours since motor majored. $1185. Bargains also in following used ships: Challenger, Robin, OX Travelair, C-3 Aeroncas (2), J-5 Stearman, OX Bird, Kinner Gee Bee trainer. Donald Hood, Box 252, Northampton, Mass. No. 41

STINSON, built June 1936—wonderful condition, many extras. Bargain price. Meinke Eldred Flying Service, Lost Nation Airport, Willoughby, Ohio. No. 42

TRAVELAIR SPEEDWING, J-6-5. Just relicensed, air wheels, excellent condition throughout. $1385.00. Wilson's Flying Service, New Kingston, Pa. No. 43

FAIRCHILD KR-34, Wright J6-5 steel prop, semi-airwheels, brakes, dual controls. Total ship and motor 320 hours. Motor modernized and just overhauled. Licensed to December 1938. Perfect condition. $1100.00 cash. George M. Milliken, Jr., 303 Boxley Bldg., Roanoke, Va. No. 44

WACO CABIN, 1936 Standard, large tanks, landing lights, flares, radio, cabin heater, oil cooler, oversize tires, turn and bank. 225 Jacobs. Ship and motor perfect. $3650.00. F.S. 423, Aviation, 883 Mission St., San Francisco, Calif. No. 45

WACO CUSTOM CABIN—1936: Jacobs 285 h.p. Lights, flares, 95 gallon gas tanks, bank & turn, rate of climb, radio compass, many other extras. The H. C. Robbins Company, Cleveland Airport, Cleveland, Ohio. No. 45A

GREAT LAKES 2T1A. Plane and motor completely rebuilt, steel prop. and full air wheel. Price $1300.00. Clarence Bryce, Croswell, Michigan. No. 46

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125 H.P. WARNER 2 pc Fairchild 24 heater, receiver, complete instruments, landing lights. Vance B. Murray, 3900 Connecticut Avenue, Washington, D. C. No. 49

FAIRCHILD 24: Model C-8-C, manufactured late 1934, powered with 145 Warner motor, equipped with electric starter, steel propeller, wind driven generator, compass, turn and bank indicator, rate of climb, thermocouple, landing lights and outside air temperature. Total time 249 hours, less than 50 hours since major overhaul. Licensed to February, 1939. Color Consolidated blue and Diana cream. Price $2895.00. Will finance 50%. Plane can be seen and demonstrated at LeRoy Airport, LeRoy, N. Y. Aircraft Finance Co., 521 M. & T. Bldg., Buffalo, N. Y. No. 50

TAYLOR CUB 1937. DeLuxe licensed to August 1938. Like new. Total time 176 hours. Dual ignition, roller bearing wheels, carburetor and cabin heater. Yellow with black trim. $1200.00. Holmes Flying Service Holmes Airport, Jackson Heights, N. Y. No. 51

STEARMAN J-6-7D: powered with Wright 250 HP motor, steel propeller, bank and turn, compass, all standard engine instruments, 32x600 tires with brakes and tail wheel, color red wings and blue fuselage, military type windshield. Price $1585.00. Will finance 50%. Plane licensed and ready for demonstration at LeRoy Airport, LeRoy, N. Y. Aircraft Finance Company, 521 M. & T. Bldg., Buffalo, N. Y. No. 52

TAYLOR CUB 1937. DeLuxe licensed to June 1938, like new. Total time 60 hours, dual ignition, roller bearing wheels, Whooster carburetor heater. Blue and yellow, $1,100. Holmes Flying Service, Inc., Holmes Airport, Jackson Heights, N. Y. No. 53

CUSTOM WACO 1935: (Nov.) Top condition. Licensed to December 1938. Radio, flares, turn and bank, rate of climb, large tanks, licensed, 5-place. Also J-5 Eaglerock; 50 hours since motor major; cover and upholstery look like new; brakes. Also J-6-5 motor—No time since overhaul. Modernized clutch type blower. Priced to sell. S. & M. Flying Service, Portland Airport, Portland, Ore. No. 54

WACO CABIN—1933: Continental 210 h.p., Motor modernized, lights, flares, 70 gal. gas tanks, bank & turn, rate of climb, wheel pants, steel propeller, radio receiver. $2,400.00. The H. C. Robbins Company, Cleveland Airport, Cleveland, Ohio. No. 54A

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IRVIN exhibition set, new 1937 28 ft. back pack white silk, chest pack pongee 24 ft. Perfect condition. $225.00. Gmoser Aircraft, Box 1808, Milwaukee, Wisc. No. 59A

Pontoons

PONTOONS FOR SALE. Edo Model 383. Hunter Company, Shrine Bldg., Memphis, Tenn. No. 60

Copy for Classified Advertisements in the May Issue Required by April 14

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U. S. Government

WAR DEPARTMENT, Materiel Division, Air Corps, Wright Field, Dayton, Ohio, Office of the Contracting Officer.—The War Department invites the submission in competition of sealed bids covering airplanes under conditions set forth more particularly in the following advertisement: Circular Proposal No. 38-385, dated January 18, 1938, Airplanes, Attack-Bomber (Two Engine), described in U. S. Army Specification No. 98-102 dated December 16, 1937; bids to be submitted to the Contracting Officer not later than 1:00 P. M., Eastern Standard Time March 17, 1939. Full particulars with respect to said advertisement may be obtained upon application to the Contracting Officer, Wright Field, Dayton, Ohio. E. T. Kennedy, Major, Air Corps, Contracting Officer.

NOT INDEXED

AMERICAN EAGLE, long nose OX-5, flown ten hours since complete rebuild, recovering and motor overhaul. New propeller. Frank Headley Jr., Lincoln Park, New Jersey.

AERONCA Sea Plane model K in perfect condition $1700.00. Tail surfaces and right wing for 1933 Aeronca. Maker offer. Glenn T. Clark, 701 Penn Avenue, Charleston, West Va.

PORTERFIELD—LeBlond 70, 1936, 125 hours, speed ring and brakes. $1100.00. Neil McCray, Fairview, Penna.

CUBS—seven of them, all models of the past three years. Come and select one. Trades and terms. Neil R. McCray, Fairview, Erie Co., Penna.

WACO A, Warner 125, like new, thirty hours since major overhaul, finish perfect, just relicensed, winter enclosure. $1550.00. Trades considered. E. J. Jefferies, 5001 Baum Blvd., Pittsburgh, Penna.

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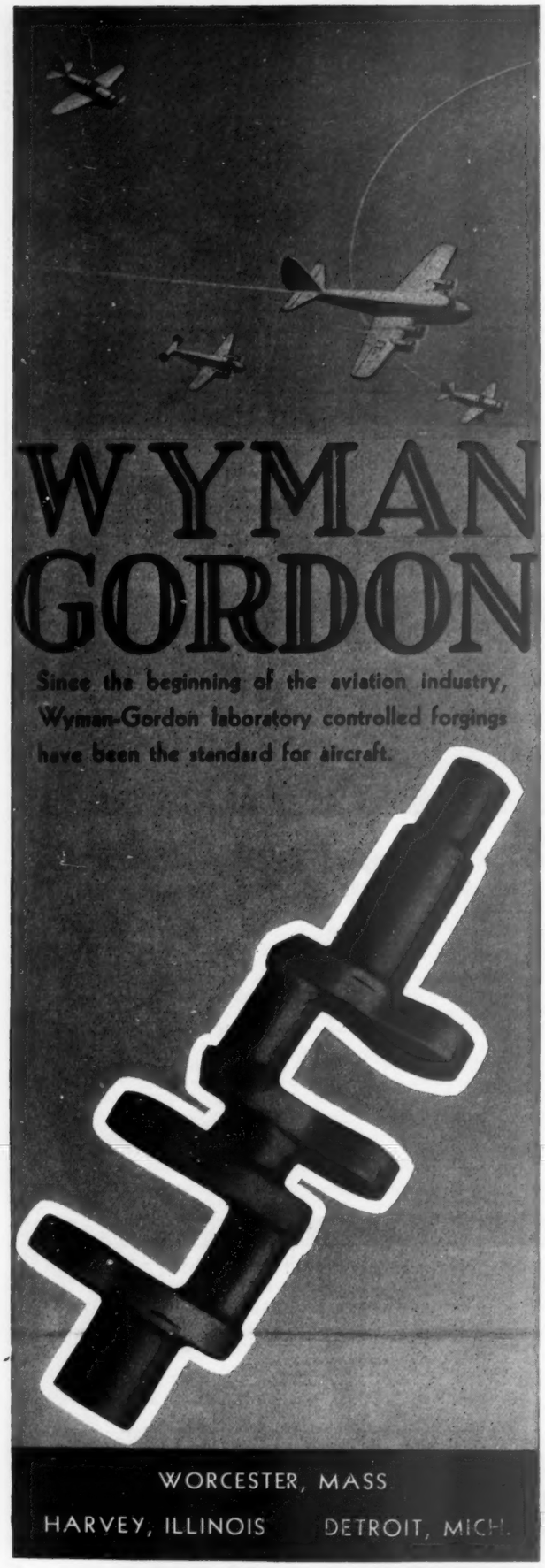
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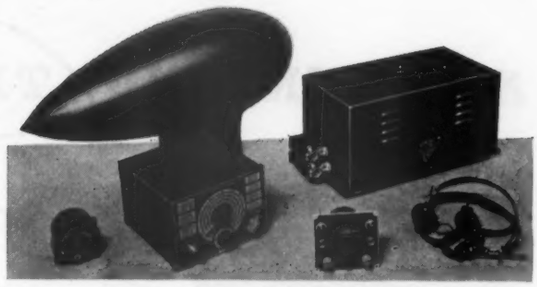

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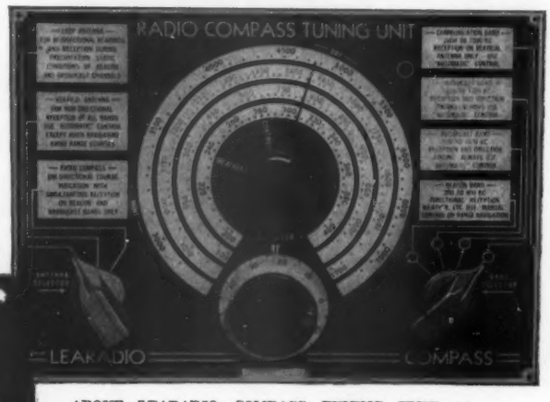

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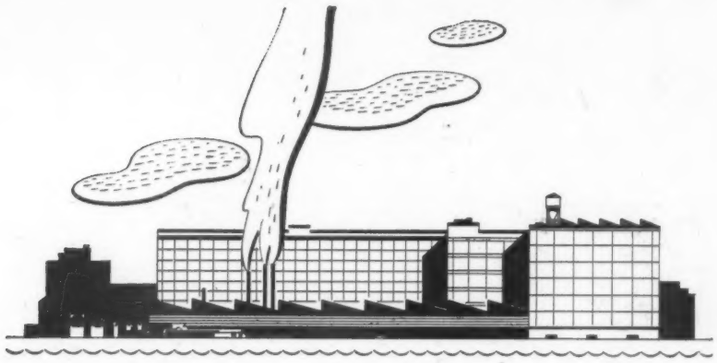

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For example, we supply many products to the aircraft industry. The first known use of Aluminum for aeronautics was in a rigid airship, about forty years ago. But twenty-five years passed before the metal was extensively applied in aviation. The fruition of the development was no accident. First, suitable alloys were produced. Then our technicians attacked the problem of proper design, in cooperation with aircraft manufacturers. After long effort in this development, our company has become inseparably associated with the progress of aeronautics.

Today, 476,603,165* passenger miles annually are safely flown by aircraft built largely of Alcoa Aluminum Alloys, powered by engines made lighter and more efficient by Alcoa Aluminum.

The success results from a double proving which our product undergoes. The thumbnail sketch at the right shows one phase of this work — rigid X-ray examination of an aircraft cylinder-head.

Then there is the proving ground of actual performance. Alcoa Aluminum for aeronautic use passes out of our plants, but not beyond our interest. Constant checking of performance in the field gives theory a double-checking, and indicates the steps necessary to prove the product still further.

These activities, not always profitable, are necessary for new and important developments. They are a proving ground for our research program for the industry. They breed improvements in shop practice, in techniques and in the product itself. ALUMINUM COMPANY OF AMERICA, 2182 Gulf Building, Pittsburgh, Pennsylvania.

*1937 data, Bureau of Air Commerce

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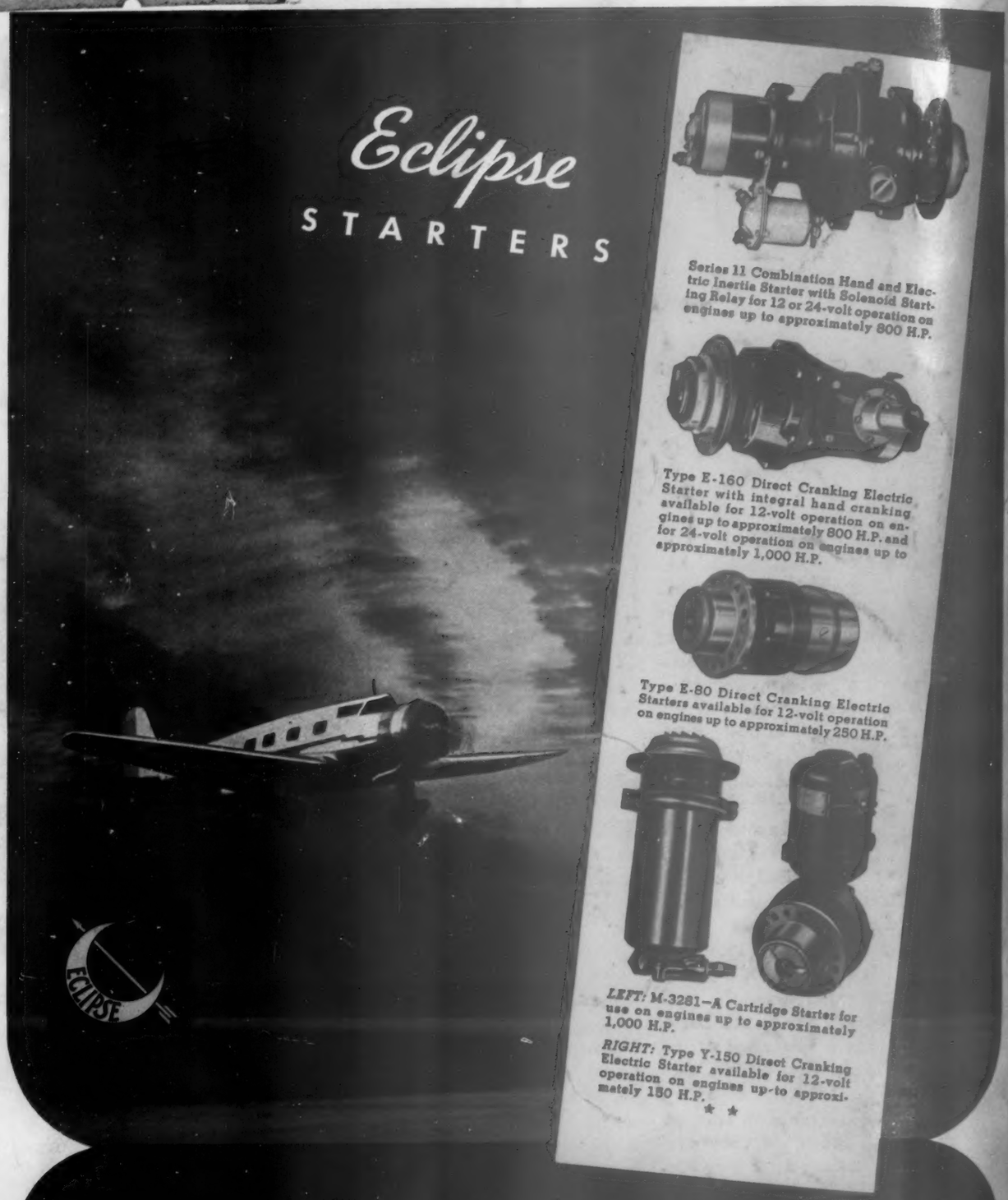

Series 11 Combination Hand and Electric Inertia Starter with Solenoid Starting Relay for 12 or 24-volt operation on engines up to approximately 800 H.P.

Type E-160 Direct Cranking Electric Starter with integral hand cranking available for 12-volt operation on engines up to approximately 800 H.P. and for 24-volt operation on engines up to approximately 1,000 H.P.

Type E-80 Direct Cranking Electric Starters available for 12-volt operation on engines up to approximately 250 H.P.

LEFT: M-3281—A Cartridge Starter for use on engines up to approximately 1,000 H.P.

RIGHT: Type Y-150 Direct Cranking Electric Starter available for 12-volt operation on engines up to approximately 150 H.P.

* *

ECLIPSE aircraft engine starters are available in a wide range of capacities and types suitable for the fulfillment of the requirements of military, transport, commercial and private installations.

Over 20 years of experience in providing for the starting equipment needs of the aviation industry in the United States and foreign fields. This background plus a continuous development program has maintained the ECLIPSE insignia as a symbol of dependability, service and progress.

In addition to the representative types of starters illustrated on this page, there are also available many other models designed for specific requirements and embodying the features which have made the use of ECLIPSE EQUIPMENT standard throughout the world.

ECLIPSE AVIATION CORPORATION
(Subsidiary of Bendix Aviation Corporation)
EAST ORANGE, NEW JERSEY